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FERNS

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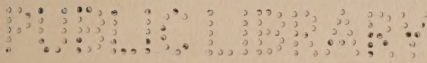
FERNS IN A MIXED BORDER

Goldie's shield fern (*Dryopteris Goldieana*) on the left; the interrupted fern (*Osmunda Claytoniana*) on the right.
(See Chapter III.)

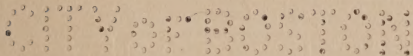
FERN S

AND HOW TO GROW THEM

BY
G. A. WOOLSON



ILLUSTRATED



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1905

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PREFACE

THIS contribution to fern literature is designed simply as a practical work for the benefit of the amateur fern culturist.

The most satisfactory way of gaining an acquaintance is to study the subjects at first hand. But we cannot always live in the woods, so a fraction thereof must live with us, that we may watch the ferns "budding, with each stem and leaf wrapped small" and continue our observations until, and after, "their spreading forms unfurl."

As the aim of this book is cultural, no special key to the genera has been prepared. Such a key would be out of place, involving more science than the nature of the book permits.

Technical terms have been eliminated as far as practicable; where it is not possible to omit them explanatory remarks follow.

The system of nomenclature used is uniform with that adopted in the "Cyclopedia of American Horticulture," with these exceptions—*Filix* replaces *Cystopteris*, and *Osmunda spectabilis* is used for our native royal fern instead of *O. regalis* as the distinctiveness of the American species is now accepted. But for the convenience of the more conservative school of fern lovers (to which the author belongs) a synonymous list of the names of ferns best adapted for special cultural uses is given. A multiplicity of English synonyms has purposely been avoided, as many of them are local, unimportant, and often perplexing.

The larger part of our native ferns which have special cultural value are illustrated by original photographs, the work of Miss M. T. Randall, Miss M. E. Manley, Mrs. H. A. Hall, Rev. G. W. Perry and Dr. H. H. Swift.

PITTSFORD, VERMONT, 1905.

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The Life of a Fern

“ Pokin’ round ’mid ferns and mosses,
Like a hop-toad or a snail,
Somehow seems to lighten crosses
Where my heart would otherwise fail.”

FERNS

CHAPTER I

THE LIFE OF A FERN

TO ADMIRE a fern for its beauty is one thing; to understand its life is another. To this end one must be on the alert, for the spring awakening of the ferns is highly interesting. In scientific parlance all true ferns must be "circinate in veneration"; that is, they must come from the ground rolled up like a watch spring. A grotesque lot they are, their stiff stalks pushing the woolly heads into the air with all the pertness of youth. Only an expert can recognize old friends in this guise.

Technically speaking, the stalk of a fern consists of the "stipe" and the "rachis." The former corresponds with the leaf stem or petiole of a flowering plant, while its con-

tinuation through the leafy portion of a divided frond is the rachis or midrib if the lamina (or leafy portion) is entire. This part, of course, is not ready for inspection until the segments (or pinnæ) begin to unroll, hence specific peculiarity of stipe is the surest test in this early stage, although no two species are coloured or "done up" just alike.

We have a group of cinnamon ferns (*Osmunda cinnamomea*) before us, the wool of which fairly drips from their uncanny heads like water after a bath, looking very much as if they "needed a maternal tongue to lick them into shape." The sun and the winds kiss them, the scales part, and a miracle is performed! The stately *Osmunda cinnamomea* is a regal exchange for the wooly head.

The rapidity of development varies greatly in different species. Ferns of fragile texture quickly unfurl their sails, while those of heavier build are comparatively slow in assuming shape.

The spring colouring is particularly beau-



Osmunda cinnamomea. The pertness of youth



Osmunda cinnamomea. The perfect development of the stately cinnamon fern

PLATE II.—YOUTH AND AGE IN THE CINNAMON FERN

tiful. The greenest of all green things growing are the freshly developed fronds of the oak fern (*Phlegopteris Dryopteris*). A fine foil to this in point of colour is the maidenhair (*Adiantum pedatum*), with its soft pink stalks deepening through shades of red, maturing in ebony. With the sunlight in its crown of pale pendant pinnæ, we have indeed the fairy of the fern creation.

The economic value of "fern wool" or "fern cotton" is duly appreciated by the birds. Certain of the smaller kinds, such as creepers, warblers and humming birds, are on the alert for this exquisitely soft product to use in felting their nests.

The dividing line between phenogamous, or flowering, plants and cryptogamous, or flowerless, plants is one of the simplest principles of plant life, nevertheless this is the rock upon which the casual observer wrecks his botanical skiff. The "brown stuff" on the back of the frond or on the stiff, dark spikes of the onocleas is often attributed to some sort of disease, whereas it is Nature's method

for perpetuating the species. In place of true seeds there are substituted tiny spores, contained in capsules, technically called "sporangia," which grow out of the veins of the leafy portion of the fronds. The so-called "fruit dot" thus formed is termed a sorus. It is this feature which so readily distinguishes the ferns from true leaves.

The classification of ferns depends largely upon the position and variation of the sori on the under sides of the full-grown fronds. Another point of importance in classification, although of less intrinsic value to the plant, is the "indusium," the thin, membranous body, more or less persistent and of various forms, which covers the sorus. Thus the genus *dryopteris* is characterised by round dots and shield-shaped indusia, the exact form of the latter depending largely upon its point of attachment. The *asplenium* family, on the contrary, has oblong or linear fruit dots with straight or, rarely, curved indusium fixed lengthwise to the upper side of the fertile vein. Nature assuredly does



Dryopteris cristata x *marginalis*. A new and valuable acquisition for cultural use



Dryopteris marginalis. The most valuable of all the wood ferns for garden cultivation is the evergreen marginal shield fern

PLATE III.—TWO VALUABLE GARDEN FERNS

not serve all alike. The sturdy polypody has no cover for its spores.

A fern spore does not directly produce a fern but a small flat and thin circular or kidney-shaped body, green in colour, called the prothallus, which is attached to the soil by delicate rootlets. On this the separate reproductive organs analogous to the stamens and pistils of the ordinary flower are produced.

The individual fern is not dependent on spores alone for its perpetuation. Perennial rootstocks are the rule, not the exception, among ferns, and only hardy species make open preparation and practical arrangement for their own demise and renewal each year. Plate 3 is a typical specimen of a species which adds much lasting beauty to our highways and byways, coming into greater prominence when deciduous foliage has dropped away. Look down into the heart of the plant and you will see that the nine stipes are holding the fronds for the coming year—all tightly rolled and packed by unseen hands. The

marginal shield fern (*Dryopteris marginalis*) is undisturbed by early winter storms, but, burdened with snow to the tips, the fronds settle close to earth, retaining their freshness and colour, but never relaxing their protecting clasp until life stirs in the springtime. When fresh young fronds unfurl their sails the tale of an evergreen fern is told.

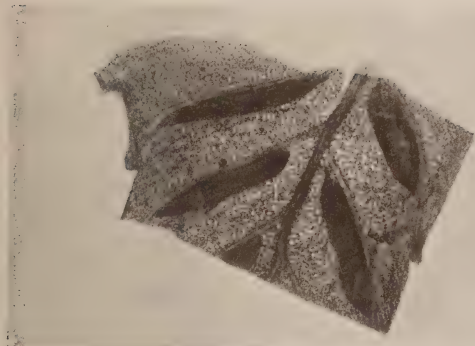


PLATE IV.—THE FRUITS OF THE FERNS

The genus *Dryopteris* on the left is characterized by round fruit dots, with shield-shaped indusia. In the centre note the long narrow fructification of the genus *Asplenium*, with straight or rarely curved indusium. On the right, portion of frond of *Dryopteris marginalis*, showing position of the spore mass (sporangia)

Where Hardy Ferns Can Be Grown

CHAPTER II

WHERE HARDY FERNS CAN BE GROWN

"It is the wild garden alone which leads us into the clouds."

—*Gibson.*

The growing desire in the human mind for something straight from the heart of Nature has brought the wild garden to our doors. Hence the fern border, with its refreshing, lingering loveliness, rivals the gaily painted garden with its transient beauty.

THE IDEAL CONDITIONS

Happy indeed is the fern culturist whose domain includes a ledge or a pile of rocks, a shaded bank, a bit of swamp and a brook, with consequent irregularity of surface, where he may successfully simulate Nature.

These ideal conditions, however, are for

the favoured few. The majority of fern lovers who would be continually reminded of woodland dells which they cannot reach have only the ordinary town lot or city back yard for displaying the souvenirs of tramps abroad. Pleasing results are easily obtained under seemingly adverse conditions, and it is worth while to learn by experience how to make the most of given surroundings.

FERNS AROUND THE HOUSE

Many of our native species are so cosmopolitan in matters of location and soil that whoever wills may grow ferns; even the owner of limited grounds may have a fern border, for the narrow strip of ground between the foundation walls of a house and the channel worn by the drip from the overhanging eaves is an ideal location, available for nothing else, but replete with conditions which ferns enjoy, e. g., a cool, damp atmosphere and good drainage.

Given an eastern exposure and partial shade, the majority of our native ferns flourish



PLATE V.—FRONDS OF THE OAK AND BEECH FERNS

Oak fern (*Phegopteris Dryopteris*)

Beech fern (*Phegopteris polypodioides*)

under cultivation with as much grace (and with but a trifle less luxuriance) as though Nature herself had selected the environment. But it must not be inferred that the growth of ferns is regulated by the points of the compass. An eastern exposure is preferable, because partial shade is a condition in native haunts and easily simulated in a situation where extremes of sun and shade are practically out of reach.

Ferns grow with tolerable grace on the north side of a house, and may be induced to do something worth while on the west, but a southern exposure is rarely successful.

SOILS AND THEIR MAKING

The close association in Nature of tree and fern offers a practical suggestion which the owners of old stumps and trees do well to note. The fortunate possessor of an old tree, with abutting bark-covered roots trailing over the ground, has an artistic setting.

The botanist looks at the soil and tells you

what ferns should be at home, and, although a natural preference is manifested, ferns possess greater adaptability than almost any other plants. Most of our common ferns will flourish in any decent soil, provided it be light and porous. Where the ground seems especially poor and hard, as it often does under trees which have absorbed the greater part of virtue and moisture for years, the top soil should be removed and replaced with something better. European growers recommend a compost of equal parts of rough peat, loam, leaf mould and coarse sand for the majority, with added loam for vigorous growing kinds, sandy peat for the most delicate, and a sprinkling of old mortar for limestone-loving ferns.

Leaf mould pure and simple in my experience is the ideal soil for nearly all save the latter class. The economical culturist learns to save all bits of waste moss and small instalments of wood's earth for the fern bed; thus in time, with little trouble, a feast of fat things may be obtained for epicurean species.

There was absolutely no special preparation of the soil, or even a formal cutting away of the sod for the luxuriant border, sections of which are shown in the illustrations (Frontis. and Plate 6). The luxuriance of this display is by no means due to careful planting, but to the fact that the soil happened to be good and other conditions right. Properly prepared beds where the environment is not as favourable are often less luxuriant.

MOVING AND ESTABLISHING MATURE SPECIMENS

The successful establishment of mature specimens in the home grounds depends largely upon intelligent transplanting, which necessitates a knowledge of the various forms of root growth. Fern culture is one thing and fern digging quite another, as the inexperienced find to their surprise and sorrow if an attempt to uproot a monarch of the swamp be made without the proper implements. It is worth while to sacrifice speci-

mens from available genera in order to learn how to uproot others without disturbing the growth by loosening the soil about the plants. For instance, the root growths of the osmundas are a dense mass of wiry, fibrous matter apparently anchored to all creation; the interrupted fern (*Osmunda Claytoniana*) is especially trying, for the thickened rootstock, massive, with imbricated base stalks, clings so tenaciously to the earth that the amateur collector will gravely assure you on his second trip that "the proper kit for the business consists of a spade, an axe and a cross-cut saw." However, the game is really worth the candle, for once taken up and carefully reset these ferns readily establish themselves, even in a different soil, and require no further attention.

The most regal member of the fern family, the ostrich fern (*Matteuccia Struthiopteris*), is less difficult to transplant because the short, thickened caudex is firmly anchored to the earth by slender stolons, all heavily fringed with delicate rootlets. A circle should



PLATE VI.—CONTRASTING TYPES OF FERN FOLIAGE

The ostrich fern (*Matteuccia struthiopteris*) and maidenhair (*Adiantum pedatum*) make an excellent combination in a fern border

be cut several inches from the crown with a knife or a sharp spade; this severs the stolons but does not materially disturb the plant if it is then carefully lifted. On the other hand, Goldie's fern (*Dryopteris Goldieana*), one of the finest of New England ferns—often growing to a height of four feet, with handsome fronds a foot broad—is easily uprooted by the hand alone. The spinulose shield ferns (*Dryopteris spinulosa*) give themselves up in like manner.

Ferns which spring from an underground branching rootstock that sends up but one frond in a place, such as the sensitive fern (*Onoclea sensibilis*), the hay-scented fern (*Dennstædtia punctilobula*) and maidenhair (*Adiantum pedatum*), are quite likely to be disturbed unless a section of turf is carefully cut and lifted. This form of root growth never runs deep, hence a sharp, flat trowel is in most cases equal to the occasion.

Many of the dainty cliff dwellers have tenacious and far-reaching roots, therefore require great care to be of cultural service.

Fortunately, many of them, like the purple cliff brake (*Pellaea atropurpurea*), are also found growing on disintegrating limestone ledges, loose sections of which can often be pulled away, laying bare the thread of life reaching for hidden springs within.

The common polopody (*Polypodium vulgare*) is an exception to this mode, as the entire mass of growth is anchored by tiny rootlets to the surface of rocks only. Sections for transplanting should be cut, not pulled, from the beautiful mat which Nature flings down here and there.

FAILURES DUE TO EXCESSIVE ZEAL

The majority of unsuccessful attempts to make ferns live even after they have been properly uprooted are due to over-zealous efforts rather than careless planting. Nature has different standards for different genera, and we have but to observe how far above the surface she carries the crowns of her ferns or buries her rootstocks beneath. A

common fault of the amateur culturist is to plant too deep and so cause the crown to rot.

Of the two extremes it is better to "dig a hole and stick them in," for slipshod planting will at least insure admission of air to the roots, a necessity indicated by the porosity of the various soils in which ferns naturally grow.

The soil should never be packed hard about ferns, unless temporarily so about large specimens, which need to be held in position until the roots have time to gain a foothold.

TRANSPLANT TO SIMILAR EXPOSURES

Another frequent cause of failure lies in selecting for a sunny location on the lawn plants which have grown in deep woods. Many species have so wide a range that individual plants may usually be found growing naturally in the same degree of sun or shade to which they are to be subjected in cultivation.

If the culturist will observe Nature always, and follow her lead, gross mistakes like that of planting a rock fern in damp leaf mould will be avoided.

Nature may have "method in her madness," oftentimes hidden beneath charming confusion, for the aim of true art is to conceal itself; therefore the goddess who rules the woods flings her "lacework" about in an apparently reckless manner. Had we the earth to choose from, assuredly no set rules could be given for the selection and arrangement of ferns for the border or other situations. However, a few hints from experience may be of service.

THE DESTRUCTIVE FERN COLLECTOR

Collectors of ferns may be classed under three heads: scientific, commercial and cultural. To be able to add new facts to a known science is the aim of all biologists. Anatomical peculiarities can only be demonstrated by the investigation of many speci-



THE WALL-RUE ON A ROCKY LEDGE

The little wall-rue is easily naturalised in the rockery



THE MAIDENHAIR AT HOME

A shallow spreading rooted species

PLATE VII.

mens regardless of life and beauty thus sacrificed; hence extinction of species often follow over-zealous efforts. The commercial collector sees only possible dollars and cents in each rare plant he happens to find. Granted that the collection and sale of living plants or herbarium specimens is lawful, there is no excuse for exterminating rare finds for greed of gain. Not long ago a successful collector of this class told me of the rare luck he had in finding a dozen or more plants of a choice variety not then noted in the state in which it grew, and indeed only two other stations were on record. This man dug up over half the plants before discretion overtook him, and he left a few roots but carried off all the fronds. The ruthless annihilation of so much natural beauty, simply because herbarium specimens brought a few cents more in the market if a little fringe of rootlets adhered to the lifeless fronds, is deplorable.

The culturist is more likely to have a keen appreciation of the real beauty of the ferns and wild flowers than collectors of either of

the other classes. He wishes to make them grow where they can be studied and enjoyed with less trouble than in their native haunts. Cultural experience not only teaches the value of the individual plant but discreet selection, for only certain forms and stages of growth will fit into the various places which he wishes to fill; these he learns to tell at a glance without reckless waste of raw material.

But the gospel of moderation is everywhere in order, for vandals are in our midst under every guise. There is no end to the wanton destruction of plant life by persons having no real interest in Nature, but who ruthlessly pull up that which attracts the eye for the moment and as quickly throw it aside. Granted that none of us *own* the wild things growing, and that nobody can "stake a claim," yet the smallest soul among us should feel conscience-stricken for spoiling, even for a laudable purpose, gems of art which Nature has taken years to perfect.



PLATE VIII.—A REGAL BEAUTY

The American flowering fern (*Osmunda spectabilis*) grows in upland or swamp, but preferably the latter. The fruited panicles recall the foliage of other plants

Ferns in the Mixed Border

CHAPTER III

FERNS IN THE MIXED BORDER

IT is always well to emphasise marked situations by tall-growing species. *Osmunda Claytoniana*, which is well shown on the right of Plate I, plays an important part in the decoration of country roads and byways, but rarely shows to better advantage than in the fern border. The botanists quote the height at three feet, which, however, is often doubled in damp woodlands; four feet is the limit of the plant photographed. There is no period in the existence of this fern when it is not attractive, but it is especially so as it is unfolding in the spring. The stipe pushes up through the dead leaves, the fern wool drops away, and a symphony in green is literally unrolled before our eyes—the fertile section of an exquisite olive shade, pale green

below and silvery green above, the colour deepens as full development is attained and the "brown stuff" in the midst of a luxuriant frond testifies to the unique method Nature employs for the propagation of the species, and gives rise to the common name of interrupted fern. This fern is second only to the ostrich fern (*Matteuccia Struthiopteris*) in stately grace and its superior beauty of colour and veining.

The most artistic effects are produced by associating contrasting species. In the second group illustrated the blue-green fronds of Goldie's shield fern (*Dryopteris Goldieana*) are largely in evidence. A few delicately cut fronds of the American royal fern (*Osmunda spectabilis*) serve as an excellent foil.* The bladder fern (*Filix bulbifera*) relieves the vivid green of the oak fern (*Phegopteris Dryopteris*), which carpets the space between the groups.

[* The best authorities now agree that the American and European osmundas are not identical. The name of *O. regalis* is retained for the latter, our plant taking the name of *O. spectabilis*, which, as a matter of fact, was given to it a hundred years ago by Willdenow. The fronds of the European species as they arise from the ground are much stronger and bolder looking than those of the native plant.—EDITOR.]

There is to my mind no happier combination in the mixed fern border than that of the ostrich and maidenhair ferns (Plate 6). It is impossible to find more strongly contrasting species. As an embodiment of grace and dignity *Matteuccia Struthiopteris* has no peer. Perfection of growth is reached only in swampy lowlands, the rich alluvial soil producing a grand vase-like circle of foliage often higher than a man's head; fine specimens are often found skirting dry woodlands or following the wall in an upland pasture. Thus by nature cosmopolitan, it takes kindly to the situation indicated. The fertile fronds are like nothing else under the sun. Curious stiff brown spikes appear within the verdant circle, a most unfernlike product, which claims the honour of naming the species, as botanists long ago discovered the plume-like arrangement of its divisions. The sterile fronds might share the honour, for if anything in Nature resembles a plume it is the sterile frond of an ostrich fern in June before the tips of the segments have lost their curl.

Adiantum pedatum, growing so luxuriantly, enhances by contrast the dignity of the stately guardians overhead. The maiden-hair is always beautiful in sun or shade, accepting whatever soil is offered, and, if taken up as directed, grows on with little interruption.

The chief beauty of this fern is architectural. The two branches of the stalk diverge at an angle of perhaps 50° , rise obliquely, gracefully recurving until they meet again. From the outside of the curve each branch sends out from two to seven diverging branchlets of varying length. Thus the whole frond is from five or six to fifteen or even eighteen inches broad, and, while somewhat funnel shaped in the centre, radiates horizontally toward the circumference, and is the most graceful thing in the fern creation (Plate 7).

Another advantage in associating these two ferns in the border is that the texture of the maidenhair, although delicately membranous, is very elastic, and, therefore, holds its freshness much longer than the ostrich fern, which



PLATE IX.—A TREASURE OF THE NEW ENGLAND WOODS

Goldie's shield fern (*Dryopteris Goldiana*) is found in shady woodland nooks, and the rare, narrow-leaved spleenwort may be sought in the same place. It is easily uprooted by the hand alone. Plant in a rich, deep soil, in shade

is often faded by midsummer. General shabbiness is evaded by breaking away the taller fronds and depending upon the maiden-hair for continued beauty throughout the latter part of the season. Even the visitations of Jack Frost, which sadly humiliate more imposing genera, are received with comparative indifference because of this very elasticity.

THE COSMOPOLITAN FLOWERING FERN

The royal fern (*Osmunda spectabilis*) is indispensable. The simple elegance of the species manifests itself in veneration, a period when many ferns are a trifle uncanny. No other fern is more deftly "done up," clothed with softer wool, or coloured so exquisitely as this.

Ferns in general are but symphonies in green, but here a prelude in Quaker drab runs softly into the green, which complements its colour scheme by a shading in and out of rosy fawn deepening into golden brown.

The man who considers a fern "a thing with a backbone and side members like a feather," is apt to be skeptical when assured that this "bush" is but a fern after all. Nature has a special arrangement for the fructification of each member of the genus, but the fruited panicle which crowns *Osmunda spectabilis* is the most graceful of all, and a plausible excuse for the misleading name of "royal flowering fern," which has been borrowed from its European prototype *O. regalis*.

The amateur will have no difficulty in naturalising it. Although a native of swamps and river banks, it grows also on uplands, where it loses some grace and gains rigidity enough to look "bushy." But it is always beautiful, often growing to a height of four or five feet in cultivation.

AN INTRACTABLE BUT HANDSOME SPECIES

The sensitive fern (*Onoclea sensibilis*) is another fern valuable for lasting freshness

and contrasting foliage. It is unmanageable in cultivation, as the underground rootstocks branch freely in all directions, sending up fronds without the delay of growing a caudex.

Colour and veining are fine, indeed the chief beauty of the fern is its elaborate reticulation over the smooth green surface. The fronds vary from six inches to three feet in height. In a mixed border they are a marked feature and are excellent for an independent corner.

THE SHIELD FERN FAMILY

The marginal shield fern (*Dryopteris marginalis*) is the most valuable of all the wood ferns. Graceful outline, blue-green colour and rich texture characterise the species. It readily adapts itself to whatever situation is offered, and there is never a period of shabbiness until the round year is full and new life stirs within the old. It is easily recognized by the spores borne along the margin of the frond (see Plate 4).

A new and valuable acquisition for cultural

use is Mr. Dodge's hybrid (*Dryopteris cristata* × *marginalis*). It has the rich colour and texture of the marginal shield fern but is more erect in habit, resembling in this respect its other parent.

The simple elegance of Boott's shield fern (*Dryopteris Boottii*) attracts attention in any collection. It is really one of the finest culturable ferns. Unlike *Dryopteris cristata*, var. *Clintoniana*, with which it is often associated in wooded swamps, it retains its dignity of pose outside its natural environment.

The spinulose shield fern (*Dryopteris spinulosa*) and its varieties are among the most beautiful of our ferns. They are indispensable indeed, for the fern garden depends upon them for its most effective lacework. The broad spreading variety (*D. spinulosa*, var. *dilatata*) is especially handsome.

A TALL FERN FOR SHADED SPOTS

In shaded situations where tall species with simply pinnate fronds are not common,



PLATE X.—THE SHIELD FERN AS A POT PLANT

An ideal fern for pot culture indoors in summer. *Dryopteris spinulosa*, var. *intermedia*

a charming effect is produced by the narrow-leaved spleenwort (*Asplenium angustifolium*), the rarest of the tall spleenworts. There is nothing in the fern kingdom which looks so cool and refreshing on a hot day as a mass of this clear-cut, delicately made-up fern. Although rarely growing in such profusion as in the natural habitat, it is cultivable and makes a pretty addition to the wild garden. An exposed situation is not advisable, as the fronds are of so thin a texture that they are easily broken by summer storms or victimised by the earliest frosts. There seems to be an affinity between this species and the strongly contrasting Goldie's fern (*Dryopteris Goldieana*). When we find one we are very likely to find the other close at hand.

THE AGGRESSIVE LADY FERN

The lady fern (*Asplenium Filix-fœmina*) is usually in evidence in any collection, often a chance comer. It is persistent and aggressive, often crowding out more delicate species.

Some forms of this most variable of all known ferns are very beautiful, but as a whole they do not merit the praise hitherto given.

The Christmas fern (*Polystichum acrostichoides*) is too well known to need comment. Its mission is to cheer the winter months and enhance the beauty of other ferns by contrast.

Of the lesser growths which fill out the mixed border, a limited quantity of the bladder fern (*Filix bulbifera*) gives a light and dainty touch. The oak fern (*Phegopteris Dryopteris*) develops early and is the greenest of all green things in Nature. The other two members of the genus are late in appearing, and consequently are valuable for freshening up the border when other species have passed their prime. The broad beech fern (*Phegopteris hexagonoptera*) is very beautiful but often grows too tall to be considered a footnote. *Phegopteris polypodioides*, sometimes called the long beech fern, is more common. It has good colour, and a distinct individuality of pose which attracts attention; the leaf spread

is nearly horizontal and the lower pair of pinnæ are turned sharply down, which gives a sort of apologetic air unusual among ferns.

FLORAL ACCOMPANIMENTS OF FERNS

It is a deplorable fact that lack of a sense of the fitness of things cheapens the decorations of a good many lawns and gardens. It is the worst possible taste to associate our native ferns with the ordinary bedding plants. In the first place, it spoils the purpose of the wild garden, literally keeping one's thoughts at home when they long for the restfulness of a journey to Nature. In the second place, one or the other is out of harmony with the surroundings. There is a certain incongruity, unobserved by the majority perhaps, but keenly felt by those in tune with Nature.

It is true that some rather pretty effects have been produced in some of our public gardens by thoughtful selection. Double daisies and forget-me-nots lose none of their

beauty if partially veiled by the maidenhair (*Adiantum*.) But it is a profanation of Nature to force ferns to live in the midst of gorgeous geraniums or other cultivated plants blazing with colour.

Where Nature has the selection of the floral accompaniments of ferns, her touch will be light and delicate. Wild flowers are the only permissible adjuncts of the fern border, whether as invited guests or as chance comers.

Beauty of design is often greater than that of colour, hence variety of foliage is often desirable. Orchids of any kind are especially fitting. A trillium here and there, or even a Jack-in-the-pulpit, may preach the gospel of good effect by contrast. Solomon's-seal droops gracefully beneath the interrupted fern (*Osmunda Claytoniana*), (see Plate 1), and is nearly as interesting in its unfolding and development. The ever present herb Robert spreads itself to the left of the oak fern, and *Clintonia borealis* carpets the space at the right. This wildling is not as well known as it should

be. There is an aristocratic exclusiveness about it which does not appeal to those who wish for something gayer than the graceful umbel of greenish-yellow bells; however, with its orchid-like foliage, it is highly decorative indoors or out. The wild strawberry gives an ideal finish to our June picture. A mass of the foam flower (*Tiarella cordifolia*) is especially pleasing. Once established, it takes the situation in hand and the ferns literally rise out of the spray of bloom in self-defence. But the daintiest conception which Nature has dropped among the ferns is the bishop's-cap (*Mitella diphylla*). This exquisite bit of floral conservatism is in perfect harmony with the "feathery fern, whether it groweth wild and free" or as a willing captive.

MASSING SEPARATE SPECIES

For the amateur gardener with only a limited area there is undeniably more varied beauty and greater interest in a mixed border;

but from a landscape gardener's point of view more striking effects are produced by massing one or perhaps two species. A row of well-developed ostrich ferns in front of a broad veranda or following the foundation walls of a stately mansion is truly imposing. More permanent beauty is insured if the maidenhair is associated with it. The situation, however, must be taken into consideration, for accessories that are befitting to a cottage are not of necessity in harmony with pretentious architecture.

A practical idea is suggested by Mr. Newman's story of the impression which fine specimens of the royal fern (*Osmunda regalis*), fringing the river between the Lakes of Killarney, made upon Sir Walter Scott. Scarcely a word had the novelist uttered in praise of the scenery, but at this point he stopped the rowers and exclaimed, "This is worth coming to see." Few of us are fortunate enough to possess a river to fringe, but fine specimens are also seen on the uplands, which is conclusive evidence that the flowering fern,



PLATE XI.—THE MOST VARIABLE OF ALL FERNS

Asplenium Filix-femina is an aggressive fern, sure to appear in any collection, and will crowd out more delicate kinds unless given attention

(*Osmunda*), is worth looking at in any situation and easy of culture. A few well-disposed plants create a display unrivalled for simple elegance among the ferns. Our native species *O. spectabilis* is an excellent counterpart of the European one.

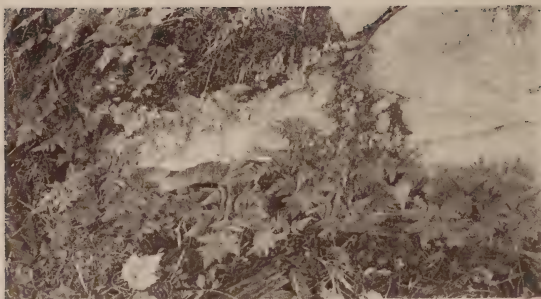
The boulder or hay-scented fern (*Dennstaedtia punctilobula*) is considered one of the most decorative of the entire fern family. Growing as it does from an extensively creeping rootstock, it is unmanageable in a limited border, but it is a good fern for massing in the open. The effect of the shimmering fronds, so "delicately wrought and sweet of scent," flanked by evergreens, is highly artistic.

The sensitive fern (*Onoclea sensibilis*) makes a fine bit of colour, grown en masse in a damp corner.

For a dry, stony bank there is nothing better than the marginal shield fern (*Dryopteris marginalis*). The Christmas fern (*Polystichum acrostichoides*) is equally fine for low massing.

Extensive grounds which are fortunate enough to possess a wooded border in which pine trees are intermingled are sure of an effective setting for fern pictures. Note the simplicity of design in the perfect medallion of shield ferns (*Dryopteris marginalis*) spread in the carpet of pine needles (Plate 31). Another choice bit of art is the Christmas fern (*Polystichum acrostichoides*), deep green and glossy, on a tawny background (Plate 13). Both pictures may be easily copied if only a pine tree is at hand to furnish the needles.

Braun's holly fern (*Polystichum Braunii*) is remarkably fine, grown as a specimen plant in a damp, shady corner. The fronds are beautiful in outline, long and tapering, rich and glossy in texture and finish, deep green above and pale green beneath. It is especially attractive as it develops, not only because the stalks are densely clothed with golden-brown scales but because the crosiers execute a double curve before they assume the graceful pose of maturity. It is sometimes called the prickly shield fern.



The oak fern (*Phegopteris Dryopteris*) is the greenest of all green things in early spring



Appears much later, when the fresh green of other ferns is passing.
The broad beech fern (*Phegopteris hexagonoptera*)



The long beech fern (*P. polypodioides*) is another late comer.
Note the downward direction of the lower pinnæ.

PLATE XII.—THE OAK AND THE BEECH FERNS

A single vase of ostrich ferns or regal osmundas on each side of an entrance, thus serving as sentinels, combine grace and dignity befitting the situation.

FERN BEDS

In shady street parks I have seen ovals filled with stately ostrich ferns (*Matteuccia Struthiopteris*), which were quite as imposing as the red cannas in neighbouring sections. The ferns were closely set and enclosed with wire netting, so that the winds had no purchase; without these precautions the first storm of summer would have taken the grandeur out of them on short notice.

The maidenhair (*Adiantum pedatum*) is a safe fern for this purpose and very artistic, if foiled by a few plants of the Christmas fern (*Polystichum acrostichoides*).

A strikingly beautiful effect is produced by sowing seeds of the scarlet field poppy in beds of the hay-scented fern (*Dennstædia*.) Both are airy and light, and in no way inter-

fare with each other's growth, and the contrast of the intense red against the pale-green fronds is superb. This is perhaps the one exception where gayety among the ferns is permissible.

CARE OF FERNS OUT OF DOORS

Once established, the care of ferns is practically nothing. My ferns are rarely watered, and never with the hose, unless a small stream is turned on and the hose allowed to lie on the ground for the purpose of soaking the roots in extremely dry weather.

One application of the full spray is as disastrous as a tornado. I have had the beauty of many choice ferns spoiled for the season by the veering of the wind which blew the spray from a hose, supposed to be out of reach, upon them. Even the maidenhair, that so-called voucher for the purity of waters near which it grows, turns brown and withers.

Now and then an elimination of undesir-



PLATE XIII.—THE CHRISTMAS FERN (*Polystichum acrostichoides*)

able weeds is imperative, and a little thinning out of over-zealous species like the sensitive fern (*Onoclea sensibilis*) and the bladder fern (*Filix bulbifera*). Careful shearing of grass is also necessary where we compromise 'twixt Nature and Art.

In the fall preservation is effected by packing deciduous fronds over their own roots and allowing some of the dead leaves which have blown among the ferns to remain as they do in Nature.

This is all very well for the ferns, but dead leaves blowing about the lawn after fall cleaning are objectionable. This is obviated by spreading evergreens over the fern beds and borders; these serve to hold the leaves in place and to cover all that is unsightly.

Discretion must be used in removing the boughs in the spring; in a sheltered situation there is little danger of being too previous, as ferns are not easily spring killed; but there is danger in delay after life stirs, for the delicate crosiers are sure to be broken or beheaded in a belated cleaning. It is granted

that this is not in accordance with Nature, but an instance of the adaptability of wildlings to conventional life.

FERN PESTS

Chief of these are the neighbour's dogs, which revel in the cool shade of house walls and settle themselves in the midst of the border with aggravating complacency. Wise fern growers keep the remedy to themselves.

Of no less importance are the neighbour's hens, which also require prompt and efficient attention to offset their fundamental efforts.

Ferns in cultivation have the same natural leaf-eating enemy that makes such havoc with certain species in the woods, a small green worm that appears early and often mars the beauty of fine plants for the season. It is well to anticipate the arrival of the despoiler by dusting the fronds with hellebore. A solution is better if the thief is at work, as the powder does not easily wash off after its mission is accomplished.

Rockwork for Ferns

CHAPTER IV

ROCKWORK FOR FERNS

ALTHOUGH many of native ferns are eminently cosmopolitan, the successful cultivation of a goodly number depends largely upon simulation of natural environment.

Glancing over the list of species at our disposal we are surprised at the number which the mind instantly associates with rocks. Rocks not only by river and roadside, but in Nature's laboratory, where the choicest of fern treasures are scattered about on open or shaded ledges. This association of rock and fern is not accidental, but a simple device of Nature for inducing a lower temperature, moisture for the fern roots, and the needful supply of disintegrating limestone or other mineral matter.

The owners of large estates may be fortunate enough to possess a naturally shaded dell, or at least a ravine which can, with little expense and trouble, be converted into a charming glade, full of nooks and corners, where hardy ferns from all parts of the earth may be naturalised. The value of such a collection needs no comment.

Rockwork plays an important part in the landscape gardener's art. But great undertakings which require skilled artisans, an endless amount of stone and much expense are confined chiefly to public parks and gardens. Boulders artistically arranged about a fountain, with a leafy canopy overhead, are for the favoured few; but a few stones judiciously placed are within the reach of the majority and will afford more pleasure in proportion to the time consumed in the making and in space occupied than could be obtained in any other way.

A shady nook is of course the ideal location, but is not always available. Partial shade, however, is imperative. Pines and

spruces make an artistic background and soften the abrupt transition from smooth lawn to ragged rocks. The colour effect of rock and fern against a screen of Virginia creeper (*Ampelopsis quinquefolia*) is particularly fine, and within the reach of all.

THE BEST KIND OF ROCK

In the selection of rocks most people have to take what they can get; but, given a choice, sandstone and calcareous rocks are the most desirable. Much of the so-called artificial rockwork is composed of tufa, a soft, porous volcanic stone of light weight.

Nothing, however, can surpass the picturesque quality of a bit of old limestone in process of decay. Freshly quarried stones of any kind should never be used; the more rugged and weather-beaten they are the better for the place assigned.

Now and then one sees a giant pebble or cobblestone landed high and dry on a sunny lawn; just a bald, impenetrable, inorganic

mass, without a depression, seam or furrow in which plant life of any kind could gain a foothold. Indeed, one might as well attempt to grow hair on an eggshell as to make even Boston ivy (*Ampelopsis tricuspidata*) cover the glaring surface. Obviously there are rocks and rocks. Those which are absolutely of no use and have no beauty are out of place on any lawn.

SOILS FOR ROCK PLANTS

Rock plants in general require light, sandy soil mixed with old mortar, if decomposed limestone is not at hand; brick rubbish also makes a satisfactory mixture. Certain species require a richer and lighter compost in which leaf-mould predominates.

BUILDING ON LAWNS

In building rockeries on our lawns we may follow general principles but may not imitate Nature in detail of construction, for too much



PLATE XIV.—NOTHING BETTER FOR A STONY BANK
The marginal shield fern (*Dryopteris marginalis*)

confusion is out of place on a well-ordered lawn; therefore we have recourse to something " 'twixt Art and Nature." Happily the stone-wall abominations, with dry, cramped pockets in which no respectable fern would attempt to grow, are things of the past.

The more exposed the position, however, the greater the need of something approaching regularity, in outline at least, for proper deference must be paid to the lawn mower. It is wise also to consider the feelings of the trimmer, else something besides grass will be cut off with the shears.

Whatever form of architecture is adopted, see to it that there is a soil connection through every pocket and crevice with the earth beneath, and that the top soil is firmed down to that which is underneath, otherwise capillary attraction will have no more chance of keeping the earth damp than in an imperfectly drained flower pot. This is the fundamental principle on which depends successful garden rockwork or rockeries.

Environments usually suggest the proper

style, which should always be simple and unpretentious.

THE CIRCULAR ROCKERY A CONVENIENCE

As a matter of convenience, I have a circular rockery on my lawn. Careful selection of stone gives a varied outline; a curved slab of calcareous rock is highly valued, as it is so advanced in decay that layers are easily sprung and ferns inserted as fancy dictates. Regularity ceases with the marginal tier of stones. Four good-sized rocks artistically irregular in shape are placed at right angles slightly inclined toward the centre; the space between the big stones is walled up to a height of two or more feet, with a six-inch wall across the open front. This gives four large receptacles below the central pocket, with a twelve-inch border and no end of tiny nooks for tucking in *petite* members of the fern family.

Unless a rockery is in a sheltered nook the height should be limited to two and a half



PLATE XV.—THE PURPLE CLIFF BRAKE AT HOME

One of the later ferns to unfold their fronds, and indispensable for the rockery

feet. No great expectations need be indulged in even at this low point, for none of our regal beauties that would answer for a centrepiece can endure the winds if thus elevated and isolated.

I had in my mind's eye an elegant vase-like ostrich fern (*Matteuccia*), which should crown my rockery with dignity and grace. My aspirations, however, were blown away, for no sooner did a frond unroll its curly tips than a wind promptly snapped the brittle stalk, and an inglorious and untidy "study in ferns" marred an otherwise successful creation. The plant was eventually removed, but stolons had penetrated in all directions and a fringe of young ostrich ferns appeared just below the summit; a beautiful wild aster volunteered inside the circle. Thus did Nature artistically adjust my failure.

THE BEST FERNS FOR ROCKERIES

Large clumps of osmundas and *Dryopteris Goldieana* were literally built into the four

sections described. Lower down in the border are specimens of the maidenhair. The dark, glossy fronds of the Christmas fern (*Polystichum acrostichoides*) are largely in evidence, contrasting well with the reliable marginal shield fern (*Dryopteris marginalis*); both in turn foil the more delicately cut and coloured spinulose shield fern (*D. spinulosa*), with its varieties. The most distinguished member of the polystichum group is Braun's holly fern (*P. Braunii*).

Fine clumps of the purple cliff brake (*Pellaea atropurpurea*) are apparently as much at home as they are among the outcropping ledges at the base of scraggy cliffs, whence spores have doubtless been wafted from their inaccessible ancestry above. This fern is interesting and valuable; it is not only beautiful in design but unique in colour, a dark blue-green emphasising all the varying tints about it. It begins to unfold its fronds late in comparison with others, a desirable habit, as the oak fern (*Phegopteris Dryopteris*)



PLATE XVI.—THE EBONY SPLEENWORT

It is always found with its roots resting on or against a stone, which is a hint for its cultivation. (*Asplenium platyneuron*)

is so intensely brilliant earlier in the season that nobody looks at anything else.

The beech fern (*Phegopteris polypodioides*), on the contrary, appears late in the season and keeps so fresh and looks so cool long after other deciduous ferns are fading that no rockery can afford to be without it. It is virtually a rejuvenator of its environment.

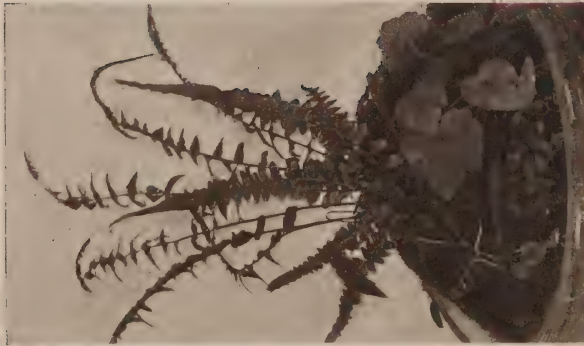
The common polypody is perhaps equally meritorious and should be lavishly used in rockwork. Of the smaller spleenworts, the ebony spleenwort (*A. platyneuron*) stands here as elsewhere like a small sentinel. Pretty rosettes of the maidenhair spleenwort (*A. Trichomanes*) are cropping out here and there, and tucked down in a shady corner is the green spleenwort (*Asplenium viride*). To the casual observer these two are much alike. Eaton (in Gray's Manual) limits the fronds of *A. Trichomanes* to from three to eight inches; those of *A. viride* to from two to six; the stipe and rachis of the former are black and shining, while those of *A. viride*

are pale green; the former likes the sun, but the latter thrives only in the shade.

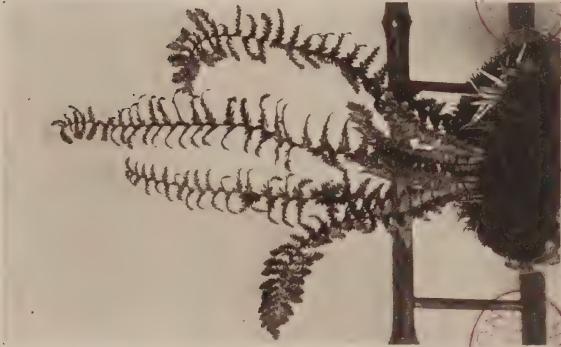
Very unlike any other of its genus is the wall rue (*Asplenium ruta-muraria*), the shy cliff dweller with sea-green fronds, which is as much at home in a rockery on the lawn as the walking leaf (*Camptosorus rhizophyllus*), which fastens its tapering points on every side.

The pretty little rusty woodsia (*W. Ilvensis*) is excellent for rockwork, requiring little soil and thriving best in the sunniest corner. There is no mistaking this, for rusty indeed it is in dry weather, but it freshens up in a shower. The obtuse woodsia (*Woodsia obtusa*) requires more shade. Nearly all of the genus are cultivable.

Nature is over lavish with her favourite pattern of lacework, as seen in the bulbiferous bladder fern (*Filix bulbifera*), graceful and fragile looking, yet the first to fling a mantle of green over rock and stone, and, as a natural sequence, the first to pass. The only remedy for this is to break away the old



The ebony spleenwort (*Asplenium platyneuron*) endures the dry heat of our living rooms. This plant has been indoors over a year, with but little change



Horton's spleenwort (*A. platyneuron*, var. *Hortonae*) is a crested form of the ebony spleenwort, and a much more graceful plant, always bright green



Scott's hybrid (*A. ebenoides*), a natural hybrid of the ebony spleenwort and the walking fern after five months' growth indoors

fronds in midsummer. This species reproduces itself in two ways: by spores and by bulblets located on the under side of the fronds; the latter start to grow so quickly after they fall that the species may become a nuisance, crowding out others equally desirable. The aftermath, however, is a compensation, for a second fragile mantle of green covers the trail of Jack Frost with fresh promise of the coming spring.

The hairy-lip fern (*Cheilanthes lanosa*), an attractive little Southerner which superficially resembles the rusty woodsia (*W. Ilvensis*), is one of the very best ferns for the lawn rockery. Growing naturally on the crest of rocks, it accepts trying situations with a better grace than many transplanted Northern species. In my own experience it is perfectly hardy, looking remarkably fresh after the severest Vermont winter on record. A light covering, however, is to be recommended for exposed situations.

No rockery is complete without the hart's tongue (*Phyllitis Scolopendrium*), the long,

glossy, undulating fronds of which are sufficiently unique to distinguish any collection. The species is easily cultivated, but also needs light protection through the winter in northern New England.

FLOWERS ON THE ROCKS

Hepaticas, violets white and blue, may bloom among the ferns; even the rock-loving columbine loses none of its loveliness in its adopted home; but the ideal accessory of ferns in the rock garden are the harebells. Such strength and delicacy are not elsewhere found in the floral world. Like a rare trait in a rough character, they grace the rugged rocks on which they grow. Just a foothold and a chance to swing and sway as the breezes come and go are all that this flower of the air demands.

A clover-leaf design may be outlined in stone and a more artistic rockery constructed than the circular affair described. The letter S is also effective in rockwork. All of



PLATE XVIII.—THE NARROW-LEAVED SPLEENWORT

desirable fern for shady situations, where tall species with simply pinnate fronds are not common.
(*Asplenium angustifolium*)

these designs are especially suited for exposed situations on the lawn. Location should always be considered, for the most picturesque of rocks may be piled the wrong way for the place assigned, and detract from rather than add beauty to otherwise harmonious surroundings.

MAKING AND SHADING THE ROCKERY

In building rockwork it matters little what sort of earth is used for the foundation; but if taken from a rubbish heap it must be freed from vegetable matter, which may decompose and eventually cause the earth to settle away from the stonework.

In the construction of small rockeries of the style described, part of the ground tier of stones may be laid and the filling piled high in the centre, and either tamped or thoroughly wet down with the hose before the inside stones are placed.

A shady corner allures the fern grower, and affords scope for bewildering confusion of

rocks and ferns or an artistical sectional arrangement, as fancy dictates. The latter is much more satisfactory in every way and may be as picturesque and informal as the material will admit or the ingenuity of the builder suggest.

Plate 22 shows the skeleton of a corner rock garden shaded by lilac shrubbery draped with Virginia creeper (*Ampelopsis quinquefolia*) on one side and by an eight-foot screen on the other, with a vine-laden wire frieze across the open front. One-foot netting fastened well up on the screen at one end and to the tree trunk on the other holds the green portière, which is easily pushed aside.

MAKING SHADE WITH VINES

In the absence of shrubbery or trees, a shaded retreat could be affected with the vine alone.

An odd lot of calcareous sand, rock and pudding stone compose the larger part of the rockwork. These stones look

as if they might wash away, but, having withstood the elements for some fifteen years, they are not likely to vanish in the near future.

They are, however, sufficiently disintegrated to make the limestone with which they are impregnated available for the cliff dwellers to be grown thereon. A few other conglomerates, chiefly limestone and quartz, are in the foreground.

INSURING PLENTY OF MOISTURE

This was an especially dry corner, as the trees and shrubbery absorbed the natural moisture from the soil. For this reason, after the ground was cleared the hose was turned on and the water allowed to play for many hours before any filling was piled on. This in turn was wet down in instalments. Evaporation was thus checked and the soil thoroughly settled.

To insure a good slope of the side slabs, which diverge from a beautiful central up-

right, the earth was piled much higher in the rear and sloped toward the open front.

Some foundation stones were laid beneath the main divisions and cement used in a few of the points. Wherever this was used it was immediately dusted over with coarse sand and pebbles inserted to match the conglomerates.

Experienced handling is imperative, as the stones, so replete in tufts and turrets, are easily injured by small breakages, which lessen their artistic value. Careful selection and grouping of material are also necessary, for there is great difference in colour and wave of sandstone; an equally beautiful stone may look like a new patch on an old garment and spoil an otherwise harmonious whole.

Nature is so lavish of material that it is not difficult to blend one neutral tint into another, thus avoiding abrupt transitions which are so detrimental to any colour scheme. Space is left for massing tall ferns outside the walls. The large pockets are of course designed

for vigorous growers. This wonderful formation is full of tiny grottoes, snug retreats and alluring nooks for the long list of dainty ferns which Nature tucks away in sheltered niches amid the ruins of the foreworld.

Although it is designed to make this rock garden a repository for a botanical collection, no attempt will be made toward grouping genera and species, since artistic value is not a secondary consideration. Only single specimens of the larger ferns will be admitted, but the lesser growths will be largely in evidence.

Space is left outside the walls for massing the common bracken or brake (*Pteridium aquilinum*), ostrich fern (*Matteuccia Struthiopteris*) and the interrupted fern (*Osmunda Claytoniana*). The tall fronds arching over the fawn-coloured stones will exquisitely frame the picture in the near future.

The royal fern (*Osmunda spectabilis*) is an admirable queen for the central pocket; maids of honour will be selected for contrast-

ing beauty, and placed with reference to colour and design of foliage.

These rocks are so unique and beautiful in themselves that special care will be taken not to overload in stocking and to prevent the ultimate growth from hiding the formation of the rockwork.

Hardy Ferns for Indoor Culture



PLATE XIX.—A FERN FOR SUN OR SHADE

The maidenhair spleenwort (*Asplenium trichomanes*) is one of the few species that likes a sunny exposure, as well as shade, wherein it differs from *A. viride*, which is much like it, although smaller

CHAPTER V

HARDY FERNS FOR INDOOR CULTURE, AND HOW TO SELECT THEM

THE deciduous nature of many of our native ferns prohibits general culture indoors. Nevertheless the genuine fern lover who gathers a wild garden outside his door is sure to take ferns inside, for the summer months at least. A few potted ferns will transform the plainest room into a charming retreat.

There is a practical side, however, to be considered, if success is to attend indoor decorative efforts with shy wildlings for material.

Proper selection of species is imperative and can only be determined by experience. Many equally beautiful ferns fail to adapt themselves to a life indoors. Certain species are physically unable to stand the transition

from the bracing atmosphere of the great outdoors to the dry air and dewless nights indoors; consequently they wither and die when other ferns flourish with tolerable grace, and often with added beauty because of the greater delicacy of indoor growth.

WHY IMMATURE PLANTS FAIL

Partially developed plants will become distorted in the half light of shaded summer parlours; therefore it is better to wait for the fronds to assume a natural pose and gain strength enough to withstand disturbance before transplanting.

Greater length of service is insured if fructification is not advanced. Aside from the selection of serviceable species, discretion must be used in choosing plants to fit the place assigned; this is not difficult, as ferns in Nature are cropping up in all sorts of places and growth is more or less governed by environment.

For a bracket plant a specimen with droop-



PLATE XX.—THE MOST GRACEFUL AND DELICATE OF OUR
COMMON FERNS

Filix fragilis above, *Filix bulbifera* below

ing fronds is much more graceful than an upright growth of the same species.

A one-sided development is preferable for a corner situation. The more vase-like and perfect the development the better for a jardinière stand or centrepiece for a table of any kind. Ferns hanging over an old log or other obstruction, or swaying downward with roots anchored to the bank above, are often exactly the right shape for mantel decoration.

RECEPTACLES OF ALL DEGREES

The sort of receptacle to grow our ferns in is a matter of taste. There is a long list to choose from between the ordinary punctured flower pot and the undrained silver fern dish.

The more simple and unpretentious the greater the harmony. Birch-bark baskets are always pretty and in keeping with a sense of the fitness of things; they are especially adapted for small ferns. Good-sized jars and boxes may be pressed into service for

ferns of larger growth, and, when glorified by a birch-bark cover, are really artistic. An attractive arrangement is a regularly made basket mounted on a tripod of white birch saplings, the bark carefully selected in order to avoid cracks or flaws, for the presence of either means leakage.

THE PROBLEM OF DRAINAGE

House-grown ferns quickly resent imperfect drainage. Even ferns which grow in swampy lowlands will not thrive in stagnant water or sour soil. Broken crocks or other porous matter will answer for drainage in the punctured flower pot, but sphagnum or other waste moss should be lavishly used in all others to take up superfluous water which cannot be drained out. Glass fern dishes are preferable to all others, because such dishes lined with a sheet of moss over an inch of pebbles are most artistic. The moss keeps the soil inside from working down, and the pebbles quickly show an over-

flow of water which may be drained off. It is well to have the sheet of moss large enough to turn over and pin down over the fern roots; this gives a neat finish and prevents too rapid evaporation.

TRIMMINGS FOR FERN DISHES

A most effective finish for the fern dish is the so-called "gray moss," or even a fluted gray lichen. The stiff growth becomes pliable when wet and is then easily adjusted. Just enough should be broken away to allow the fronds to push through without damaging the tender crosiers. This combination of green and gray is very lovely.

In a large jar for ferns, fully a third of the contents should consist of broken porous material with several inches of moss above. Light soil only should be used; often enough is taken up with the ferns to sustain life indoors for months.

Old-fashioned goblets or tumblers are especially dainty fern holders. Empty shells

are an aggravation to the fern lover, who longs to stuff a delicate, feathery fern into their pink throats. The slender, graceful bladder fern (*Filix*) is never seen to better advantage than in some such simple holder. In short, nothing is too good for the service in the eyes of the fern lover, hence gems of the china closet are appropriated in spite of domestic disapproval.

Tin boxes can be made to fit any desired space, a strip of birch bark fastened around converting plebian material into something artistic. Anything of this sort should be painted inside to prevent rusting, and birch-bark baskets are more desirable if lined with tea lead.

Another pretty device for holding potted ferns of generous growth may be made of a packing box covered with bark and mounted on a rustic standard of the sawhorse style of construction. Such an arrangement is decorative indoors or out, and serves a double purpose if placed on a veranda just outside of a window. It is always pleasant to look



PLATE XXI.—THE WALKING FERN

Curious and interesting; one of the best for rockeries. The ends of the fronds penetrate into fissures of rock and take root, hence its popular name

through or over the head of a Lilliputian fern jungle, and it adds a decorative feature to piazza furnishings.

The limited list of summer ferns for use indoors is nearly all of the *dryopteris* family. *Dryopteris spinulosa*, var. *intermedia*, is by far the most satisfactory. It is a beautiful fern of good texture; it is easily uprooted, rarely wilts, and will thrive anywhere if given decent treatment. It excels all other species in its indifference to change of light. Many ferns turn yellow and look sickly if transferred from the open to a dimly lighted parlour. It is no small feat, however, to get a good large plant unbroken out of a tangled mass of underbrush. There is but one way, to tuck the roots under one's arms, holding the fronds back with the elbow, and then go ahead. I have thus secured many superb plants in perfect condition for indoor decoration.

The type shield fern (*D. spinulosa*) is also of service. It usually grows more in the open than either of its varieties, hence requires a well-lighted room in order to hold its own.

The spreading shield fern (*D. spinulosa*, var. *dilatata*) is big and plummy, beautiful in the right place.

D. marginalis is of a rich blue-green colour, good for contrasting effects; it bleaches quickly in shaded rooms, but holds its own for many months in stronger light.

The Christmas fern (*Polystichum acrostichoides*) is especially effective potted with the maidenhair or the hardy shield fern. A long, drooping specimen sweeping the air from the top of a bookcase or other elevation is very striking. The endurance of this fern depends largely upon whether the roots were disturbed in transplanting and on the advance of fructification. I never knew a matured specimen with heavily fruited tips to be of much service indoors, but sterile plants often keep in fair condition six or eight months.

THE MAIDENHAIR FOR SECOND CHOICE

The native maidenhair (*Adiantum pedatum*) is second only to the hardy shield fern



The foundation and details of construction



A section of the rockery, filled
 PLATE XXII.—A FERN ROCKERY

(*D. spinulosa*, var. *intermedia*), and is to many eyes more beautiful. No comparison, however, should be made, as they are of distinct types. A fine clump of maidenhair in a bark-covered butter jar appeals to the æsthetic mind more forcibly than any palm in an elaborate jardinière.

A PLEASING GROUP FOR INDOORS

Here is a good grouping of ferns for a birch basket: The maidenhair and the tall simple fronds of the narrow-leaved spleenwort (*Asplenium angustifolium*), foiled by dark, glossy fronds of the Christmas fern (*Polystichum acrostichoides*), relieved here and there by the bladder fern (*Filix bulbifera*). The broad beech fern (*Phegopteris hexagonoptera*) is effective if used only with ferns of lower growth. The pose of the fronds is peculiar. They show to advantage on a platter of moss, where they gracefully stretch a green canopy over lesser growths beneath.

The oak fern (*Phegopteris Dryopteris*),

if taken up early in the season, is pretty in small receptacles and keeps its colour.

We may drape our homes "by the yard," if we like, with the most graceful and filmy of our common ferns, the bladder fern (*Filix bulbifera*). So great is its adaptability that it flourishes not only in sylvan retreats but also in the wild garden at our door and equally well indoors. If plants are taken up early in the season, May or June, they will last through the summer. The root growth is small and requires little soil to maintain it in good condition.

If one frond dies another is unfolding to take its place. It may be grown on a platter with mosses or in shallow baskets or shells. Nothing, however, can exceed the simple loveliness of a single plant with a bit of moss in a slender glass.

AVOID OVER-WATERING

Very little care is required by summer ferns indoors. The one thing to be avoided is

over-watering. Where it is practicable, it is a good idea to set the pots outdoors on still nights, showering lightly and returning them to the house before the sun strikes them in the morning. High winds are always disastrous.

TREATMENT AFTER SUMMER

In the fall the ferns may be set out in the ground in a shaded place and will again be ready for service the following year.

Ferns in the Living Room

CHAPTER VI

FERNS IN THE LIVING ROOM DURING WINTER

THE dry heat of our homes in winter is not at all favourable for the growth of native ferns, which by right should rest at least four or five months of the year. A few species, however, break the natural order of things and may be kept growing indoors with fairly good results.

The cheerful little polypody is always pleasant to look upon if one "sees through and beyond." It is astonishing how this rock-clinging species holds its own in any situation. It is especially attractive grown in birch-bark baskets accompanied by herb Robert, with its happily contrasting foliage.

In Plate 17 is a pretty specimen of ebony spleenwort (*Asplenium platyneuron*). As an all-round fern this species takes prominent

rank. The plant photographed was taken from pine woods in July, and a year later had not materially changed. The only noticeable difference is the loss of one or two of the old fertile fronds and a profusion of new sterile ones clustering about the base.

THE SECRET OF SUCCESS

The secret of success in the cultivation of both species is the simulation of natural environment of the root growth. Thin bits of limestone or other rock must be placed against the fern roots, and moss and earth enough added to hold them in place. This is the one imperative demand of the ebony spleenwort. I have never taken up a specimen of the genus whose roots were not resting on or against or tucked under a stone of some sort. *Aspleniums* as a rule are limestone loving ferns, but the ebony spleenwort is sometimes found on certain slate formations.



PLATE XXIII.—INDOOR ROCKERIES

The purple cliff brake, wall-rue, maidenhair, spleenwort and walking leaf—all limestone lovers—the hart's tongue and the common polypody may be used for indoor rockeries such as these

I count myself of the favoured few privileged to find and test the cultural qualities of the celebrated hybrid, Scott's spleenwort (*Asplenium ebenoides*).

SCOTT'S SPLEENWORT UNDER CULTIVATION

This strange fern partakes of the natures of both its parents, *Asplenium platyneuron* and *Camptosorus rhizophyllus*, and its cultural possibilities are much the same. Great care was exercised in perfecting the drainage in the glass fern dish, also in propping the stones upon which the roots rest in such a manner that the natural pose of the plant was exactly the same as when growing on the mossy slope between the rocks. My plant was taken from a limestone ridge in July, and five months of indoor growth is represented in the picture (Plate 17). The older fronds retain their colour and show a greater tendency toward developing rooting apices indoors than they do when grown outdoors. The stronger influence of the walking leaf is apparent in the new comer,

whose fronds without exception would root at the tips if unlimited space could be given.

Nature is capricious and fails to please herself sometimes. Tired of the stiff prettiness of the very correct little ebony spleenwort, she took the step aside which entailed the long controversy over the origin of the unique product called *Asplenium ebenoides*. No appreciable beauty was thus added to the genus, but much of interest.

This mystery was hardly brushed away when another "sport" possssing desirable attributes which the type and its hybrid lacked posed before the botanical world. *Asplenium platyneuron* var. *Hortonæ* is a valuable acquisition as a cultural fern on account of its greater gracefulness. *Asplenium platyneuron* is frequently off-colour and the *ebenoides* too light, but the newer acquisition is a bright, rich, medium shade of green, so pronounced that a single plant in the midst of an abundance of the type instantly attracts attention. Cultural conditions are the same for the entire group.



PLATE XXIV.—MAKING AN INDOOR ROCKERY

The form in stone and the artistic result after planting is complete

When the longevity of rare finds is of greater importance than decorative growth indoors, it is wise to observe the inevitable period of rest before Nature asserts her rights.

A "RESTING" PERIOD

For instance, my three plants of the hybrid *Asplenium ebenoides* were taken indoors in July. The growth of all was carefully watched and encouraged through the winter; consequently the plants were so exhausted by the time they were hardened off in May and placed in an out-of-door rockery that the issue of their struggle for life was doubtful in the fall of the following year. Two of them lived through the winter and gradually regained strength, but not enough to withstand the spring winds of a second season.

Profiting by the experience, my *Hortonæ*—a find of July, 1903—which like the *ebenoides* grew rapidly indoors, was relegated to the cellar in November, where it simply stood still in the dim light for four months. After

this enforced rest it was restored to daylight, and in a few weeks became the most perfect specimen fern it was ever my lot to own.

An unusually fine plant of the dainty maidenhair spleenwort (*Asplenium Trichomanes*) is shown in Plate 29. This plant has been growing for years like an ordinary potted plant. The natural habitat is much the same as that of the ebony spleenwort, but I have seen fine plants luxuriating in deep leaf mould, which accounts for the success of the specimen in question.

THE PREFERENCES OF THE WALKING FERN

The walking leaf (*Camptosorus rhizophyllus*) prefers a rocky foothold, but grows remarkably well indoors with an apology of mineral matter beneath its roots. It is more decorative than any green-ribbon concoction of milliner's art could be. It is an exceptionally interesting fern because of its unique habit of growth.

Spores are not only wafted hither and

thither by fitful winds, but the long, tapering fronds rooting at the apices throw up other progressive plants. This is the tramp as well as the scribe of the fern family—the sole member of the group literally walking a crack in the rock or inscribing wonderful things on moss-clad walls. The root growth of the walking leaf seems to be a matter of circumstance, for the species thrives equally well in the outdoor world, with much or little nether development.

For cultural purposes full-sized specimens growing in thin moss are to be avoided; they can be made to grow indoors or outside, but it saves time to select plants from earth-filled crevices or from thick sheets often found on the top or at the base of rocks.

The staying qualities of the fronds are unprecedented. I have in mind one remarkably fine specimen with adherent plantlets, all carefully taken up and properly placed on the platter with moss. New growth appeared, other fronds rooted at the apices, but the original fronds were in good condi-

tion for two years. A few weeks only of this time were spent in the cellar for enforced rest. The strength of texture may be realized when it is seen flourishing on the rocks in April while the snow was yet deep about the plants. There is but little change in colour of the fronds, even after a severe winter.

A FERN THAT WITHSTANDS THE RADIATOR HEAT

Strange as it may seem, the purple cliff brake (*Pellaea atropurpurea*), which often hangs from an almost invisible seam on the face of a perpendicular cliff, subjected to intense heat in summer and all the bitterness of a bleak New England winter, is a first-class fern for indoor winter culture. It is a rapid grower, flourishing but a few feet from coal fire or radiator, in a north or south window. It quickly forgives neglect, and, if allowed to dry up out of doors or indoors, recovers in due time when put in a moist atmosphere. It makes but one imperative demand, and that is the

privilege of standing still. Over-zealous culturists usually like to turn things around, but revolving cliffs are not in the natural order of things. The slender black stipes are very susceptible to change of light, and warped and twisted fronds result.

All of the above ferns hold their freshness under adverse circumstances, but rarely send out new growth until February.

In acclimating ferns taken indoors in late fall or early winter, avoid, as far as possible, a rapid transition from a cold atmosphere outside to over-heat inside. A gradual rise of temperature will insure the best results.

Screens are very useful in shutting off heat. An occasional showering keeps the foliage healthful. Over-watering is always disastrous.

Native ferns indoors are subject to the ordinary plant pests, chief of which are green aphids and slugs. Confined fumes of tobacco will answer for the one and whale-oil soap suds for the other.

Fern Rockeries Indoors



PLATE XXV.—AN IDEAL FERN FOR INDOOR CULTURE

The purple cliff brake, which grows naturally on the perpendicular face of a rugged cliff, thrives amazingly within a few feet of the radiator or coal stove

CHAPTER VII

FERN ROCKERIES INDOORS

FERN culture approaches the ideal when we take the rocks indoors as well as the ferns. The fascination of a rock garden is even greater indoors for those who appreciate the luxury of "pokin' 'round" mid ferns and mosses in midwinter.

If the association of rock and fern is a design in Nature for cooling the atmosphere and retaining moisture for the benefit of the root growth, how imperative the need of such environment indoors, where no refreshing dews counteract the dryness and overheat. Nature gives her choicest ferns a rocky setting, and here as elsewhere we should follow her lead. Lawn rockeries are an old institution, but indoor affairs are not in the regular schedule.

Japanese principles of art are equally applicable to rockwork. Why not a Lilliputian rockery as well as a garden? Anything under seventy-five pounds' weight is practicable, and not in the least formidable. However, the right kind of rock for the purpose is not within the reach of all.

The majority of nature lovers gravitate toward country byways, always replete with treasure of one sort or another for the naturalist. Sooner or later observant eyes find what they seek. If the quest is for rocks, rocks grooved and punctured with alluring pockets will surely protrude from stone wall or stone heap, or perchance an isolated specimen may crop up at our feet and tempt us to extricate a marvellous conglomerate seemingly designed for this special use.

Magnificent quartz crystals like the sixty-pound specimen shown in Plate 23 are not met with every day. Something else would answer as well for a beehive in a wall, consequently the original tenants were turned out

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PLATE XXVI.—THE BOSTON FERN

By far the best of the larger exotics for house decoration. Thrives in almost any temperature, if above the freezing point

and the cliff brake moved in. Roomy apartments in the top, grinning fissures at the sides, cosy nooks and pockets here and there, invite the fern culturist to rival Nature if he can.

The foundation of the pretty study in Plate 23 is an interesting conglomerate, composed largely of quartz, opaque and transparent, with other heterogenous elements. Although a very good thing as Nature left it, a few touches of Portland cement, with and without odd bits of stone, have added much to the staying qualities of soil and water in certain shallow places which the pose of the rock would otherwise have rendered useless.

Perhaps the most unique and beautiful thing which it has been my pleasure to handle in this line of work is a dainty gem displayed in Plate 24—a poem in stone which not only attracts the eye by its simple beauty but which suggests Nature's greater achievements along the same line, basaltic columns, palisades, rather than a mere fragment of rock dropped by the wayside.

Rocks selected for indoor use should be cemented to a flat base from two to four inches thick. By so doing, the stone itself is not only shown to better advantage but all the lower cavities are made available.

So far as trays for holding indoor rock-work are concerned, there is little choice in the market. If lacquered ware is used it should be lined with tea lead or painted with some rust-proof preparation. Agate iron-ware is stronger and less likely to bend with the weight upon it when moved. But, whatever the material, the article should be deep enough to catch all drip and roomy enough to admit of an artistic setting, as the frame may enhance or mar the beauty of any picture.

Intelligent and artistic filling of rocks requires time and thought and proper implements and selection of plants for the work. I have discovered that a small spoon is better than a trowel for throwing loose soil into the crevices, and that a hardwood meat skewer makes a practical tamping tool. A quantity of invisible hairpins or fine wire which can

be easily cut and bent is imperative for pinning the moss over the fern roots; every plant should be thus carpeted to prevent rapid evaporation of moisture and to beautify both rock and stone as we see it everywhere in Nature.

My stock for filling the beautiful crystal consisted of good specimens of the purple cliff brake (*Pellæa atropurpurea*), wall rue (*Asplenium ruta-muraria*), the maidenhair spleenwort (*Asplenium Trichomanes*), an abundance of walking leaf (*Camptosorus rhizophyllus*)—comrades all in the limestone cliff—lip fern (*Cheilanthes*), hart's tongue (*Phyllitis*), with the common polypody (*Polypodium vulgare*) and dormant roots of phegopteris complete the fern list. Sundry wild flowers are also in evidence. Mosses galore are essential; a few lichens and a basket of leaf mould mixed with disintegrated limestone are all the material we need ask of Nature.

The combination of walking leaf and wall rue is to my mind particularly pleasing. The

splendid roots of the cliff brakes have really more room in this rock and choicer soil than Nature often allows the species out of doors. Seams in the rock insure perfect drainage. Although this last named thrives on little or nothing out of doors, it is certainly appreciative of better conditions.

Every fern on the rock is carefully tamped in, and nearly all are as well supplied with soil and moisture as their out-of-door kin.

The margin of the tray outside the base to which the crystal is cemented is first covered with sphagnum for drainage, a light layer of soil over this, with the thinnest possible suggestion of stone here and there for the benefit of certain fern roots which are to rest thereon. Mats of walking leaf, with the most beautiful mosses the autumn woods can furnish, relieved by wildlings, herb Robert and mitrewort, form an effective setting. Heavier pins are used to fasten on the tray the material used, that no gaps or seams mar its beauty and lessen the chances of growth.



The holly fern (*Cyrtomium falcatum*) is the best fern with glossy, dark green leaves. Easily grown in leaf mould. Water freely and give an annual rest



The dwarf sword fern (*Nephrolepis cordata*, var. *compacta*) takes less room than the Boston fern and surpasses it in brilliancy of colouring, but is more delicate





Walking leaf and the cheery little polypody are used chiefly in filling the conglomerate. Both species are properly rock ferns, but Nature is an expansionist, hence her rules are not always arbitrary. The polypody at the right base is growing finely in a soft filling of earth. The walking leaf on the top is the only specimen of its kind that I ever found growing in at least six inches of rich leaf mould. Dormant roots of toothwort (*Dentaria diphylla*) were in the soil, hence uninvited guests crown the summit with pretty tri-foliate leafage. Lycopodiums are of service, adding another shade or two of freshness and variety to indoor rockwork. Another wildling (*Dalibarda repens*), with leaves like a violet and flowers of a strawberry, deserves to be better known, as there is nothing more immaculate than its starry white blossoms, which dot the mossy carpet of damp woodlands in midsummer. The plant is easily cultivated.

Two points must be borne in mind in filling any stone: we must follow natural outlines,

that is, emphasise natural projections and depressions, and also maintain perfect simplicity by careful selection of few and faultless specimens of whatever species are used.

The graceful droop of an unusually strong wall rue (*Asplenium ruta-muraria*) on the left is worth remarking; such specimens are never found growing in the open. Lift the branches of the evergreens which sweep low on rocky hillsides. Rare finds await you perchance beneath a brush heap. The perpendicular crevices on the right call for tiny rosettes of the English maidenhair (*Asplenium Trichomanes*), and wee plants of the walking leaf (*Comptosorus*). Heavy clumps of cliff brake (*Pellæa*) would spoil the light and airy effect which this particular subject calls for, likewise a crowded base or overloaded tray would ruin an otherwise artistic creation (Plate 24).

Almost the only really serviceable moss for indoor winter use, especially for open room culture, is known to botanists as *Anomodon rostratus*. It is said to be common,



The maidenhair family (*Adiantum*) gives us many excellent ferns for house culture



Rusty woodsia (*Woodsia ilvensis*) will thrive in the sunniest corner of the rockery



Climbing fern (*Lygodium japonicum*) will cover a trellis in the window garden



but in my experience it is intensely local. It grows on rocks and around the bases of trees in wet places; not in swamps, but often on a rocky bank which catches the drip from above. It is a rare thing to see this moss in midsummer, but in early fall, if rains are abundant, the most delicate lacework is wrought by unseen hands on rocks which a few weeks before were apparently destitute of all plant life. Medallions may be carefully peeled off, and are just the thing for carpeting the soil about the fern roots on the rocks, and if closely pinned rarely fail to grow. Again, we find thick, undulating sheets of this same moss which are just the thing for carpeting trays. The species may be called a plain moss, compact and neat in manner of growth, an ideal background for a single specimen of walking leaf or a solitary stalk of wintergreen with its cluster of crimson fruit.

Although Nature is careful of the type, she believes in variety and effects some happy combinations by a mixture of mosses. The

anomodon dotted with tiny rosettes of a darker green is very beautiful.

All manner of lichens relieve the intense green of mosses by their limited allowance of colour. Sheets of very young walking leaf, such as one finds at the base of cliffs, may also be used for carpeting. They are sure to grow, and the fresh colour of the new fronds is cheering indeed in midwinter.

In the care of an indoor rockery extremes must be avoided. An excess of moisture is as disastrous as the lack of it. An angle-necked rubber plant-sprinkler is the only apparatus which will reach all points and can be regulated at will. The ferns in shallow crevices should be watered every day, preferably at night—never when the sun is upon them. The drip from the rock usually keeps the growth on the tray moist enough, but all-over showering is occasionally necessary.

Strong light is preferable to direct exposure to the sun's rays from any direction. One very successful rockery that I have in mind flourished for years in a north window.

Others equally fine have been grown on small tables placed at the left of the opening of a southern bay window where slanting rays strike the ferns only in the afternoon. Again I insist that revolving cliffs, not being in the natural order of events, the temptation to turn things around must be resisted.

As for temperature, no arbitrary rules can be given. Of course the cooler the situation the less the moisture required.

Fern Culture Under Glasses

CHAPTER VIII

FERN CULTURE UNDER BELL GLASSES AND IN THE WARDIAN CASE

THE pernicious atmosphere of some of our modern homes, induced by dry furnace heat and gas, is not conducive to luxuriant growth, or even to the existence of ferns in general.

Fortunately atmospheric effects of this sort are practically if not wholly overcome by the moisture engendered by the confinement of plant life under glass. It is interesting to note the evolution of an idea originating from the accidental discovery of a tiny fern growing spontaneously in a wide-mouthed bottle containing leaf mould to the ideal fern case which offers the necessary conditions for the successful growth of ferns under glass in an otherwise unfavourable location.

An atmosphere free from soot and injuri-

ous gases is thus obtained, and an even degree of humidity is insured. With light, heat and change of air, ferns of the right sort flourish much better under glass than they do without cover.

The evolution from the bottle to the Wardian case includes the bell glass, which is the resort of the majority who would grow ferns under adverse conditions or with the least trouble. These, if properly filled and rightly managed, are very satisfactory.

Such glasses are obtained with comparative ease, as they are often found among taxidermists' supplies, but it is sometimes difficult to obtain a satisfactory base, as the use of the bell glass for a fern case is not usual and the conventional fern dish is not made with reference to glass covering of any sort. There is nothing in the market which answers exactly.

The old-fashioned soup plate is the only utensil which has come within my reach that affords room for drainage and admits of an air space between the glass and filling.

The older the plate the broader the rim, hence a centenarian soup plate may have other than æsthetic value. Such improvised fern houses may range from seven to ten inches in diameter.

The fundamental structure or ground plan must of necessity be somewhat regular, and should be composed of broken crocks or other porous matter, waste moss, soil and bits of rock as needed, held firmly in place by hairpins, great and small, and carpeted with mosses carefully "tacked" down. Careful selection of species is imperative, for filmy deciduous ferns easily "damp off" under glass, hence are of little use. Only hardy or half-hardy species can be counted on for lasting effects.

It is really astonishing to see the way certain ferns luxuriate under the bell glass; the walking leaf (*Camptosorus*) often becomes prolific at every tip, vainly reaching about for a rocky crevice in which to anchor its rootlets, but contenting itself by growing a perfect plant in mid-air.

Growth thus confined often takes on a form differing a little from that of open-air plants. Erect species become undulating or wavy, taking on grace as the strength of the plant lessens. Although ferns will live on year in and year out under glass, they will surely die if permanently removed, as they have not stamina enough to withstand the drier air after living any length of time in confined humidity.

The care of bell-glass ferneries is much less than is required for open culture. Showering with a small rubber plant sprinkler once a week, or every ten days perhaps, is usually sufficient. The air should be changed daily by leaving off the glass for a few minutes, that is, if the glass fits closely over the base.

They are not often perfectly true on the edges. Air enough may thus steal in to prevent decay, but not enough to damage the growth within, even if from a questionable atmosphere. If perchance a glass should happen to fit too well it may be raised a trifle by inserting a match or a toothpick in the

moss. No better environment for forcing the development of leaf buds or apple blossoms could be found, and the experiment is worth while, for heralds of the coming spring are always pleasant.

The Wardian case may be called the memorial to Mr. Ward's discovery of the principles upon which successful fern culture depends when under adverse circumstances. This very excellent idea, however, was not carried to perfection; for insufficient ventilation, lack of proper drainage and construction, which render filling difficult, may be counted among the defects of the original model. Efforts to obviate the defects have been made with varying success. A near approach to the ideal is here illustrated (Plate 31).

The dimensions must be regulated to fit the space which the case is to fill. Extreme measurements taken from the base of the lower moulding of the model before us are 25 x 20 x 17 inches; the two long panels, 24 x 16 inches, with ends 16 x 16 inches.

The picture-frame order of architecture is

here enforced, therefore the corner posts are not posts at all. The four frames are mitred together, half-inch splines being used on the corners only. A groove $\frac{1}{2} \times \frac{1}{2}$ inch is rabbeted out for the accommodation of the adjustable panels, which are the leading feature of the fern case. Anyone who has attempted a fernery where the entire case must be lifted off for filling or fixing will appreciate the convenience of panels which are easily removed (Plate 30). The glass is of heavy quality, each piece neatly framed, with half-inch stuff grooved an eighth of an inch to receive it. No putty is used in any part of the work. In case of breakage a couple of screws on one side of the frame can be taken out and new glass slipped in.

Brads secure the panels at the bottom, and pins made of bicycle spokes serve for the top; these slip through a slot into corresponding holes in the frames, and the fern case is intact. Ordinarily the upper moulding would hold the top in place, but for greater security against the unexpected, small



Asplenium trichomanes as a potted plant



An artistic creation in green and gray (Maidenhair)

PLATE XXIX.—THE HARMONY OF THE PLANT AND ITS
RECEPTACLE

nickel plates at each end of the pan are screwed to the base of the end panels. By removing these screws the entire top can easily be lifted off.

The zinc-lined pan is provided with a faucet for drawing off superfluous water, thus preventing the disastrous water-logged condition from which ferns often suffer at the hands of the inexperienced.

Holes bored in the upper sides of the end panels usually answer for ventilators, but if these are insufficient to admit fresh air the covers can be raised at will, as it is furnished with small brass hinges.

Nearly all of the woodwork is of curly maple, beautiful in itself but a trifle obstreperous under the plane; therefore other hard woods are preferable. Here the physical needs of the ferns call for the same preparation as elsewhere for drainage—porous matter, sphagnum, leaf mould—after which come the ferns, wild flowers, lichens and mosses.

Rocks may be introduced, filled or otherwise; glades spanned by moss-grown logs are

easily simulated. Copy Nature in detail as fancy dictates and the woods are within your door.

Native ferns and exotics of heavy texture only grace our fern case (Plate 30). A fine specimen of the dwarf sword fern (*Nephrolepis cordata*, var. *compacta*) figures on the left.

On the right a hart's tongue (*Phyllitis*) is flanked by the bulbiferous bladder fern (*Filix bulbifera*), a variegated brake (*Pteris*) stretching its long fingers through the central hollow, giving the needed contrast in foliage. Deciduous ferns like the bladder and beech ferns (*Filix* and *Phegopteris*) have no staying qualities, as they easily damp off, but all the same they are worth growing, if only for a limited season.

The possessor of a roomy fern case with movable panels will find much pleasure by introducing flowering plants of the months as they come and go. The wild ginger opens the season always in my wild garden out of doors and in. Jack-in-the-pulpit appears in March. Arbutus buds and pussy-willows

develop in April, followed by the airy foam flower (*Tiarella cordifolia*), and violets white and blue will answer for May. June delights us with a charming touch of pink in the twin flower (*Linnæa borealis*). July gives us the fragrant shin leaf (*Pyrola*) and August an orchid or two. September seemingly twists the lady's-tresses especially for the fern case. This flower is much more effective with ferns in deep moss than growing by the roadside. If more pronounced decorations for special occasions are desired, cut flowers may be used.

In October the winter filling of the fern case should be done; red berries take the place of flowers. The wintergreen (*Gaultheria procumbens*) is a most valuable accessory of winter ferns and may be lavishly used in the fern case.

An inch or two of root growth will insure life and growth under glass. Select long-stemmed plants bearing clusters of but slightly coloured fruit. It is extremely interesting to watch their rapid growth and

deepening colour; their keeping qualities are marvellous. It is no uncommon thing for specimen plants to mature and then hold their fruit in perfect condition for twelve or fourteen months. The size of the glass-grown fruit far exceeds that of outdoor growth.

Second only to the wintergreen is the partridge berry (*Mitchella repens*). The foliage is attractive in itself, but doubly so if tipped with scarlet. Either plant gives the desired dash of colour, but as the two shades of red are inharmonious they should not be placed near each other.

Occasional showering, airing, frequent opening of the faucet that stagnant water may not eventually sour the soil, with a semi-annual house cleaning, is small labour for the returns given.

PESTS OF THE FERN CASE

There is no phase of organic life exempt from the depredations of an enemy of one



PLATE XXX.—AN IDEAL FERN CASE

For details of construction see Chapter VIII

sort or another. Ferns in glass houses assuredly cannot "throw stones." Sooner or later a destroyer starts in.

The green aphid and common scale (*Lecanium*) must be subjected to tobacco fumes, hand picking and whale-oil soap. These are the common pests of home-grown ferns whether under glass or not. Others seemingly indigenous are no doubt imported. Only constant vigilance and wary devices can outwit the snail. Another reprobate equally destructive is the so-called "thousand-legged worm." The lightning-like rapidity of this nuisance makes a chase useless. Watch for him with a pair of open scissors and snip near the head.

FERN GROTTOS

One of the most expensive and elaborate artificial fern grottoes in the United States is at Philadelphia, Pa. In this wonderful dell the owner has succeeded in getting together over five hundred species and varie-

ties of ferns. This collection is especially interesting to fern students because of the grouping of genera with correct labelling.

The shape of this grotto is octagonal, measuring 31 x 44 feet. Rugged and weather-worn stones only were used in its construction. The inside work is the product of Japanese workmen, although an increase of height and other alterations have since been made. The story of its making and management belongs properly to the domain of exotic fern culture, and is beyond the scope of this volume.

Exotic Ferns Without a Greenhouse



CHAPTER IX

EXOTIC FERNS WITHOUT A GREENHOUSE

ALTHOUGH the majority of the fern strangers within our gates flourish well in glass houses, comparatively few adapt themselves to open living-room culture. Of the accommodating minority we must look to the sword fern family for the champion, which defies adverse conditions and easily takes the lead as the largest and most decorative house plant to be found in parlour, hall or living room the world over.

The type, *Nephrolepis exaltata*, has given place to its more graceful variety, the so-called Boston fern (*N. exaltata*, var. *Bostoniensis*), which is much better known and more widely appreciated than the choicest wildling which our native fern flora can offer. Equally fine specimens are seen in cool offices, store

windows or over-heated living rooms. Few ferns submit to such a wide range of temperature; anything, in short, above the freezing point will do. The genus seems also indifferent as to receptacles in which to live, thriving as well in an undrained bean pot as in a common flower pot hidden or not by a costly jardinière. True, however, to the inherent nature of the race, this particular fern prefers a light soil. It likes plenty of water, yet it can go dry for a long period with but little damage.

Growth may be stimulated in various ways, preferably by liquids. It is my own experience that cold coffee is especially beneficial to ferns in general. Fabulous tales are told of the "boom" in growth resulting from burying oysters in the pot, but bonemeal is certainly more wholesome. Phosphates are also suitable, and are said to be disastrous to the white worms which somehow manage to infest soil supposed to be sterilized.

The old aphorism, "Every dog has his day," is applicable to the plant world. A new star arose, and for a time it seemed that

the old-time favourite must give place to the plumose variety, *Piersoni*, and now there comes the still more plumed Tarrytown variety. Yet the old Boston fern still holds its ground. The complex cutting of the fronds in these newer varieties permits of variation in colour so that light-green tints are always against the older, darker growth. It is difficult to tell which is the more pleasing, the mossy effect of the young fronds or the more magnificent plumes of the mature plant which both stand and droop gracefully. Again, the Scott fern (*N. exaltata*, var. *Scottii* of the florist) compels attention because of its compact sturdy habit—it is a condensed Boston fern.

The dwarf kidney or sword fern (*Nephrolepis cordata*, var. *compacta*) is a pretty little fern, more delicate than the other members of the genus, surpassing the Boston fern in richness of colour and taking up so much less room that it can be grown in cramped quarters when the other would be too aggressive.

The greenhouse maidenhair (*Adiantum*

cuneatum), the best known of the true maiden-hair ferns, is another familiar plant in many homes, popular even before the recognition of the sword fern. This dainty, feathery thing is the ideal centrepiece for any sort of table. And if it demands more careful culture than the sword ferns it surely is not difficult to grow, for plants live on for twenty and even thirty years. The veteran plants I have in mind are occasionally put into the ground for the summer, in shade of course, and allowed to take care of themselves for a time, a privilege not abused, as they both rest and grow. Cutting back now and then is also beneficial. Plenty of water is imperative. Unlike the Boston fern, the fronds wither quickly if the soil once becomes dry. Other members of the genus submit with more or less grace to ordinary living-room culture, but *A. cuneatum*, the stand-by of the florist, takes the lead, as it is the most easily cultivated and the fronds last longer when cut; hence its superior decorative value. A soil composed largely of sterilised leaf mould is preferred.



PLATE XXXI.—THE FERN CASE IN USE
Dwarf sword fern, hart's tongue, bladder fern and brake

The artistic value of the brake (*Pteris*) tribe is rapidly gaining recognition. As a class they are excellent foils for the maiden-hairs (*Adiantums*) and for all other ferns with finely cut fronds. No professional thinks of filling a fern dish without commingling the two. There is considerable beauty as well as individuality in the genus. The Cretan brakes (*Pteris Cretica* and its variety *albo-lineata*) are perhaps most often seen outside the greenhouse. The fronds are unique in design, and in colour, too, in the white-lined variety. They are all especially strong in texture, hence their indifference to varying temperatures and other conditions disastrous to more delicately constituted genera.

Another sub-tropical *pteris*, known in the trade as *P. adiantoides*, is a larger-growing sort, sending out long, gracefully drooping fronds which bear no resemblance whatever to the former species. It is only moderately successful as a house plant, but bears heat well and requires little water.

One of the most desirable of all ferns for

house culture is the holly fern (*Cyrtomium falcatum*). As a specimen plant it is very striking. The rich, glossy fronds, dark above and light beneath, are especially effective if allowed to droop over birch-bark or other light covering. It is a pity that the species is not better known, as it is easy of culture, preferring a soil composed largely of leaf mould, and asks only for a moderate amount of water, an occasional rest, and perhaps a little lower temperature than the Boston fern approves for an every-day life. Few of the many tropical and sub-tropical spleenworts (aspleniums) take kindly to house culture. Belanger's (*A. Belangeri*) is an easy growing species, and the obtuse spleenwort (*A. obtusilobum*) is especially suited for basket culture.

A charming plant for the window garden is the pretty climbing fern (*Lygodium Japonicum*). Whether allowed to cover a trellis or twist its stem about a cord or wire, it grows rapidly if it grows at all. But if the growing end is broken all progress is suspended; the

main stem may have lateral branches, but Nature never attempts to remedy a terminal disaster. Aside from the unusual climbing habit, it is an attractive fern, light in colour, beautifully cut, especially those fronds which are tipped with fertile segments.

The advantage of tropical or sub-tropical ferns over equally beautiful native species for living-room culture lies in the fact that they require no long period of absolute rest, consequently the renewal of foliage is imperceptible; whereas many native ferns are distinctly deciduous, and even our hardy or half-hardy sorts drop down to rest even while retaining their freshness of colour. As already stated, certain species are benefited by enforced rest, but it is not of vital importance.

THE SOIL TO PROVIDE

As a general rule light soil is preferred by most ferns. Leaf mould, black and beautiful, suits species which require much water. Others which prefer to go dry shod thrive

best if sand or disintegrated limestone is mixed with upland mould.

Clean foliage is imperative. If frequent showering is not convenient, as it rarely is with plants of much size, the most delicate are never injured by a feather duster, for ferns, like people, must breathe.

PESTS OF INDOOR FERNS

Fern pests, alas! are many, not in kind but quantity. Even the Boston fern (*Nephrolepis*) may be covered with the insidious scale before we dream that aught can ail it. No easy method is known of getting rid of this nonshakable encumbrance. Hand picking is neither pleasant nor very effective. Scraping or rubbing off with a stiff brush dipped in whale-oil suds or a kerosene emulsion is much better. *Adiantums* are especially subject to this pest and should be watched closely, and affected fronds removed in an early stage. If a glistening, sticky substance is seen, beware, for it is but the prelude of danger ahead.

The green aphid is another common pest especially in love with a certain graceful pteris. But it usually succumbs to confined tobacco fumes.

Red spider now and then dots the pale green side of the holly fern (*Cyrtomium*), but it is not difficult to exterminate, as the red mites abhor water.

The tiny white worms and black flies in the soil, which seem to be forever swapping identities, are more difficult to exterminate. A little ammonia or lime in the water has a wholesome effect, and common phosphate sprinkled on top of the soil before watering seems to make them gloriously ill. Much of this trouble may be avoided if the soil is thoroughly sterilised.

There has been a great increase in the popularity of exotic ferns in recent years. A glance at shady nooks or secluded corners in public and private parks shows that native genera have by no means a monopoly of out-of-door culture, but that many imported species hitherto supposed to serve only for

interior decoration figure largely and effectively in the open border in conjunction with other foliage plants, if shaded from the direct rays of the sun and well supplied with water.

This innovation puts the fern bed or border within the reach of many who have access to greenhouses, but not to native ferns in their haunts.

Of the foreign element in the open border, the dwarf Brazilian tree fern (*Blechnum Brasiliense*) may be counted on for striking effect, as it is an unusually strong grower. The slender hare's-foot fern (*Stenoloma tenuifolia*, var. *stricta*, or *Davallia stricta* of the nurseries) is also one of the best ferns in cultivation. When especially bold lines are needed there is nothing better than the golden polypody (*Phlebodium aureum*, *Polypodium aureum* of the florists), because of its large foliage and glaucous bluish colour. Very popular, too, is the silver pteris (*Pteris quadri-aurita* var. *argyrea*), noted for its large foliage, distinguished by a broad band of white through the centre of each frond.

Given a few such headlights, the filling in between of less pretentious ferns is simple indeed, and sufficiently artistic without any mixing with other foliage plants.

Ærial Fern Culture

CHAPTER X

ÆRIAL FERN CULTURE

A FERN that requires no mundane soil but subsists on air and water, is obliging enough to rest when it suits our convenience to have it rest, and which will spring into active life again when we desire it to do so—if we furnish water for the purpose—is indeed a fern worth having. Such is a possibility of the now popular fern ball, made from the creeping ærial rootstock of the pretty scaly hare's-foot (*Davallia bullata*). The rhizomes branch freely and are pliable when wet. They are deftly bound over wire frames filled with sphagnum, into which the rootlets are sent from the rootstock and from which they draw the necessary moisture.

Balls are perhaps the most popular form,

but miscellaneous designs are on the market. The most amusing product is certainly the fern monkey. This facetious idea is so well developed that on one occasion the attendant of an Italian organ grinder took off his hat and respectfully saluted a new acquaintance of his own kind. The failure to return the compliment, however, awakened curiosity, and the flesh-and-blood monkey attempted to tear the stuffing out of the vegetarian without further ceremony.

The original of the photograph is given a daily bath for five or six months of the year, and in October or November is usually relegated to the cellar, where he hangs in a comatose state from the water pipe for several months, having, it is said, a beneficial effect on delinquent plumbers.

The fronds of the *davallia* are light and airy and delicately curved, and on the present subject prove clearly that there is no place where a fern can be other than graceful.



PLATE XXXII.—A FANTASTIC FANCY

The scaly hare's-foot fern (*Davallia bulbata*) trained on a base of moss will thrive
if given water

Ferns for Special Purposes

CHAPTER XI

FERNS FOR SPECIAL PURPOSES

[The matter of nomenclature of the fern family being in a somewhat chaotic state, it has been thought well to give the synonymy according to three of the best known authorities. In the first column the name given as the "standard" is substantially that used elsewhere in this volume, the authority for which is explained in the preface. The other columns indicate the synonymy according to Britton and Brown's "Illustrated Flora of the Northern States and Canada," and Gray's "Manual."—EDITOR.]

FERNS FOR THE MIXED BORDER

BRITTON AND BROWN

GRAY

STANDARD NAME	GRAY	BRITTON AND BROWN
<i>Adiantum pedatum</i>		
<i>Polystichum acrostichoides</i>	<i>Aspidium acrostichoides</i>	<i>Dryopteris acrostichoides</i>
"		
<i>cisum</i>	"	" var. <i>incisum</i>
<i>Dryopteris Bootii</i>	"	" <i>Bootii</i>
" <i>Filix-mas</i>	"	" <i>Filix-mas</i>
" <i>Goldieana</i>	"	" <i>Goldieanum</i>
" <i>marginalis</i>	"	" <i>marginalis</i>
" <i>cristata x marginalis</i>	"	" <i>cristatum x marginalis</i>
" <i>spinulosa</i>	"	" <i>spinulosum</i>
"	"	" var. <i>dilatatum</i>
"	"	" var. <i>intermedium</i>
<i>Asplenium angustifolium</i>		
" <i>Filix-femina</i>		
<i>Filix bulbifera</i>	<i>Cystopteris bulbifera</i>	
" <i>fragilis</i>	"	" <i>fragilis</i>
<i>Onoclea sensibilis</i>		
<i>Mateuccia Struthiopteris</i>	<i>Onoclea Struthiopteris</i>	
<i>Osmunda cinnamomea</i>		
" <i>Claytoniana</i>		
" <i>spectabilis</i>	<i>Osmunda regalis</i>	
<i>Phegopteris Dryopteris</i>		
" <i>hexagonoptera</i>		<i>Phegopteris phegopteris</i>
" <i>polypodioides</i>		

FOR MASSING IN SEPARATE SPECIES

STANDARD NAME	GRAY	BRITTON AND BROWN
<i>Adiantum pedatum</i>		
<i>Polystichum acrostichoides</i>	<i>Aspidium acrostichoides</i>	<i>Dryopteris acrostichoides</i>
<i>Dryopteris marginalis</i>	" <i>marginale</i>	
<i>Dennstaedtia punctilobula</i>	<i>Dicksonia pilosuscula</i>	<i>Dicksonia punctilobula</i>
<i>Onoclea sensibilis</i>		
<i>Matteuccia Struthiopteris</i>	<i>Onoclea Struthiopteris</i>	
<i>Osmunda spectabilis</i>	<i>Osmunda regalis</i>	

FOR SINGLE SPECIMENS

STANDARD NAME	GRAY	BRITTON AND BROWN
<i>Polystichum acrostichoides</i>	<i>Aspidium acrostichoides</i>	<i>Dryopteris acrostichoides</i>
<i>Polystichum Braunii</i>	" <i>Braunii</i>	" <i>Braunii</i>
<i>Dryopteris marginalis</i>	" <i>marginale</i>	
<i>Matteuccia Struthiopteris</i>	<i>Onoclea Struthiopteris</i>	
<i>Osmunda spectabilis</i>	<i>Osmunda regalis</i>	

FOR FERN BEDS

STANDARD NAME	GRAY	BRITTON AND BROWN
<i>Adiantum pedatum</i>		
<i>Polystichum acrostichoides</i>	<i>Aspidium acrostichoides</i>	<i>Dryopteris acrostichoides</i>
<i>Dennstaedtia punctilobula</i>	<i>Dicksonia pilosuscula</i>	<i>Dicksonia punctilobula</i>

FERNS FOR THE LAWN ROCKERY

STANDARD NAME	GRAY	—	BRITTON AND BROWN
<i>Adiantum pedatum</i>			
<i>Polystichum acrostichoides</i>	<i>Aspidium acrostichoides</i>		<i>Dryopteris acrostichoides</i>
“ <i>aculeatum</i>	“ <i>aculeatum</i>		“ <i>aculeata</i>
“ <i>Braunii</i>	“ var. <i>Braunii</i>		“ <i>Braunii</i>
* <i>Dryopteris Filix-mas</i>	<i>Nephrodium Filix-mas</i>		“ <i>Filix-mas</i>
* <i>Dryopteris Goldiana</i>	“ <i>Goldianum</i>		“ <i>Goldiana</i>
<i>Polystichum munitum</i>	“ <i>munitum</i>		“ <i>munitum</i>
<i>Dryopteris spinulosa</i>	“ <i>spinulosum</i>		“ <i>spinulosa</i>
“ <i>dilatata</i>	“ var. <i>dilatatum</i>		“ var. <i>dilatata</i>
“ var. <i>inter-</i>	“ var. <i>intermedium</i>		“ “ <i>intermedia</i>
<i>media</i>			
* <i>Asplenium angustifolium</i>	<i>Asplenium ebeneum</i>		<i>Asplenium platyneuron</i>
“ <i>platyneuron</i>			
“ <i>Hortonia</i>			
“ <i>ebenoidea</i>			
“ <i>ruta-muraria</i>			
“ <i>Trichomanes</i>			
“ <i>viride</i>			
<i>Camptosorus rhizophyllus</i>			

* Those marked (*) should be used as specimen plants, or massed as background for corner rockeries

FERNS FOR THE LAWN ROCKERY—Continued

STANDARD NAME	GRAY	BRITTON AND BROWN
<i>Cheilanthes lanosa</i>		
<i>Cryptogramma acrostichoides</i>	<i>Cheilanthes vestita</i>	
* <i>Matteuccia Struthiopteris</i>	<i>Onoclea Struthiopteris</i>	
* <i>Osmunda cinnamomea</i>		
* " <i>Claytoniana</i>		
* " <i>spectabilis</i>		
<i>Pellaea atropurpurea</i>		
<i>Phegopteris Dryopteris</i>		
" <i>hexagonoptera</i>		<i>Phegopteris phegopteris</i>
" <i>polypodioides</i>		
<i>Pteridium aquilinum</i>	<i>Pteris aquilina</i>	
<i>Phyllitis Scolopendrium</i>	<i>Scolopendrium vulgare</i>	<i>Scolopendrium Scolopendrium</i>
<i>Woodsia Ilvensis</i>		
<i>Woodsia obtusa</i>		

* Those marked (*) should be used as specimen plants, or massed as background for corner rockeries

FOR POT CULTURE IN SUMMER

STANDARD NAME	GRAY	BRITTON AND BROWN
<i>Adiantum pedatum</i>		
<i>Polystichum acrostichoides</i>	<i>Aspidium acrostichoides</i>	
<i>Dryopteris marginalis</i>	" <i>marginalis</i>	<i>Dryopteris acrostichoides</i>
" <i>spinulosa</i>	" <i>spinulosum</i>	
" " <i>var. dilatata</i>	" <i>var. dilatatum</i>	
" " <i>var. intermedia</i>	" <i>var. intermedium</i>	
<i>Asplenium angustifolium</i>		
<i>Felix bulbifera</i>	<i>Cystopteris bulbifera</i>	
<i>Phegopteris Dryopteris</i>		
" <i>hexagonoptera</i>		

FERNS FOR INDOOR WINTER CULTURE

STANDARD NAME	GRAY	BRITTON AND BROWN
<i>Asplenium platyneuron</i>		
" <i>Trichomanes</i>	<i>Asplenium ebeneum</i>	
<i>Camptosorus rhizophyllus</i>		
<i>Pellaea atropurpurea</i>		
<i>Polypodium vulgare</i>		

FERNS FOR INDOOR ROCKERIES

STANDARD NAME	GRAY	BRITTON-BROWN
<i>Asplenium platyneuron</i>	<i>Asplenium ebencum</i>	<i>Asplenium platyneuron</i>
" <i>Trichomanes</i>		
" <i>ruta-muraria</i>		
" <i>viride</i>		
<i>Cheilanthes lanosa</i>	<i>Cheilanthes vestita</i>	
<i>Camptosorus rhizophyllus</i>	<i>Camptosorus rhizophyllus</i>	
<i>Phyllitis scolopendrium</i>	<i>Scolopendrium vulgare</i>	<i>Scolopendrium scolopendrium</i>
<i>Polypodium vulgare</i>	<i>Polypodium vulgare</i>	
<i>Pellaea atropurpurea</i>	<i>Pellaea atropurpurea</i>	
	Also young plants of:	
<i>Dryopteris spinulosa</i> and var. <i>intermedia</i>	<i>Aspidium spinulosum</i> and var. <i>intermedium</i>	
" <i>marginalis</i>	" <i>marginale</i>	
<i>Polystichum acrostichoides</i>	" <i>acrostichoides</i>	<i>Dryopteris acrostichoides</i>

NATIVE FERNS FOR INDOOR CULTURE UNDER GLASS

STANDARD NAME	GRAY	BRITTON AND BROWN
<i>Asplenium platyneuron</i>		
" <i>ruta-muraria</i>	<i>Asplenium ebeneum</i>	
" <i>Trichomanes</i>		
<i>Camptosorus rhizophyllus</i>		
<i>Polypodium vulgare</i>		
<i>Phyllitis Scolopendrium</i>	<i>Scolopendrium vulgare</i>	<i>Scolopendrium Scolopendrium</i>

FERNS NOT SUITABLE FOR NATURALISATION IN ORDINARY GARDENS

STANDARD NAME	GRAY	BRITTON-BROWN
<i>Dryopteris Noveboracensis</i>	<i>Aspidium Noveboracense</i>	
<i>Dryopteris Thelypteris</i>	" <i>Thelypteris</i>	
" <i>cristata</i>	" <i>cristatum</i>	
" <i>Clintoniana</i>	" var. <i>Clintonianum</i>	
" <i>simulata</i>		
<i>Asplenium thelypteroides</i>		<i>Asplenium acrostichoides</i>
<i>Lygodium palmatum</i>		
<i>Cryptogramma Stelleri</i>		<i>Pellaea Stelleri</i>
<i>Woodwardia areolata</i>	<i>Pellaea gracilis</i>	
" <i>Virginia</i>	<i>Woodwardia Angustifolia</i>	

NOTES ON UNDESIRABLE SPECIES FOR
NATURALISING IN HOME GROUNDS

Lack of dense shade and constant moisture exclude the beautiful Clinton's wood fern (*Dryopteris cristata*, var. *Clintoniana*) and both woodwardias from ordinary cultural lists. This is to be regretted. The first named will grow readily anywhere, attaining good size and colour; but the fronds are so articulated to the rootstock that they are prostrated apparently "without rhyme or reason," in the prime of life when grown in the open. This fern is a distinguished feature of wooded swamps; an aristocrat in the "Garden of the Gods," but, alas, a victim of environment. The type *cristata* is more adaptable, and usually grows satisfactorily, but to my mind it is the least graceful of all known ferns.

The net-veined chain fern (*Woodwardia areolata*) would be a striking feature in any border if it would adapt itself.

The Massachusetts fern (*Dryopteris sim-*

ulata) has never responded to my cultural efforts beyond making a sickly growth which disappeared before the end of the second summer.

The Hartford fern (*Lygodium palmatum*) is said to take kindly to cultivation. It is not so in my own experience on a town lot.

The slender cliff brake (*Cryptogramma Stelleri*) is an elusive little beauty. Sometimes it is found growing in thick moss on rocky projections, and which can easily be taken off intact. It would then seem to have no excuse for not continuing the business of life on some other rock in any shady corner. But I do not believe that the species ever gains a permanent foothold far from running water or shaded ravines, as a damp atmosphere is essential to ferns of such fragile texture.

Other species mentioned in the foregoing list are marked as "unsuitable," merely upon questions of taste, and should by all means be included in collections where the greatest possible range of species is desired.

HARDIEST EXOTICS FOR HOUSE CULTURE

- Adiantum cuneatum* and its many varieties
 " *Capillus-Veneris* and varieties
Asplenium Belangeri
 " *obtusilobum*
Cyrtomium falcatum
Lygodium Japonicum
Nephrolepis exaltata
 " " var. *Bostoniensis*
 " " var. *Piersoni*
 " *cordifolium*, var. *cordata compacta*
Pteris Cretica, var. *albo-lineata*
 " *adiantoides*

EXOTICS FOR SHADED FERN BORDERS

- Adiantum cuneatum*
 " *bispidulum*
Blechnum Brasiliense
Stenoloma tenuifolia, var. *stricta* (*Davallia stricta*)
Polystichum aristatum, var. *variegatum* (*Lastrea aristata*,
 var. *variegata*)
Lomaria ciliata
Nephrolepis cordifolia (*N. cordata compacta*)
Phlebodium aureum (*Polypodium aureum*)
Polystichum aculeatum, var. *proliferum*
Pteris adiantoides (of the nurseries)
 " *quadriaurita*, var. *argyræa* (*P. argyræa*)
 " *Cretica*, var. *albo-lineata*
 " *serrulata*, var. *cristata*
 " " var. *voluta*
 " *tremula*

FLORAL ACCESSORIES

*(a) For the Rockery**For a Touch of Colour Among Tall Ferns*

Meadow rue
Wild aster
White snake-root

Especially Useful for Foliage Effects

Jack-in-the-pulpit
Orchids
Solomon's seal
Wild ginger

For a Low Border at the Base of Ferns

Bishop's cap
Clintonia borealis
Foam flower
Herb Robert
Wild ginger
Wild strawberry

(b) For the Rockery

Columbine
Daisy (limited)
Harebell (in quantity)
Hepatica
Herb Robert
Violets

For large or pretentious rock gardens, any of the wild flowers suitable for the border may be effectively used; and certainly golden-rod should be added to the list.

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